

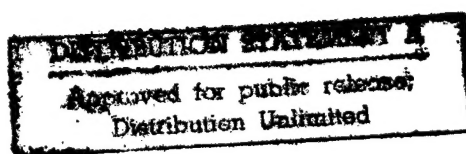
302197

JPRS-ESA-85-026

29 August 1985

East Europe Report

SCIENCE AND TECHNOLOGY



19981022 091

DTIC QUALITY INSPECTED

FBIS

FOREIGN BROADCAST INFORMATION SERVICE

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

3
88
A05

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

29 August 1985

EAST EUROPE REPORT

SCIENCE AND TECHNOLOGY

CONTENTS

CZECHOSLOVAKIA

New Biology Research Center in Southern Bohemia (Dusan Brabec; PRAVDA, 13 Jun 85).....	1
Stress Adaptation Studied (Marek Jensik; RUDE PRAVO, 19 Jun 85).....	3
Academy Cooperates With Industry (Stanislav Stibor; RUDE PRAVO, 19 Jun 85).....	5
Public Health Research Needs Specified (L. Rosival; NOVE SLOVO, 25 Jul 85).....	8
CSSR Research Cooperation With CEMA Countries (Anton Blazej; NOVE SLOVO, 25 Jul 85).....	11
Improved Teaching Methods for Science, Technology (Z. Caha; STROJIRENSTVI, No 4, 1985).....	15

GERMAN DEMOCRATIC REPUBLIC

Key Role of Electronics in Industry, Economy Analyzed (Klaus Krakat; FS ANALYSEN, No 6, 1984).....	19
Production Planning Manager on CAD-CAM Use (Reinhard Mattern; NEUES DEUTSCHLAND, 25 Jun 85).....	61
Modernization Steps in Automation Equipment Enterprise Cited (Werner Wege Interview; NEUES DEUTSCHLAND, 25 Jun 85).....	63
Progress in Robotics Design, Production Described (Juergen Bauer; NEUES DEUTSCHLAND, 25 Jun 85).....	65

HUNGARY

Computer, Electronics Exports Foundering (Margit Racz; FIGYELO, 18 Jul 85).....	67
--	----

Statistical Office Computer Policy Crucial (FIGYELO, 11 Jul 85).....	71
Briefs	
Hungarian, Indian Scientific Cooperation	74
POLAND	
Contents of Latest Automation, Cybernetics Journal Summarized (ARCHIWUM AUTOMATYKI I TELEMCHANIKI, No 4, 1984).....	75
High-Tech Journals Summarize Contents (MECHANIK, No 1, 1985; POMIARY AUTOMATYKA KONTROLA, No 3, Mar 85).....	78
Advances in Mechanical Engineering	78
Advances in Measurement Technology	79
ROMANIA	
Shortcomings in Implementations of Solar Energy Plans (Mihail Florescu; FLACARA, 31 May 85).....	82

CZECHOSLOVAKIA

NEW BIOLOGY RESEARCH CENTER IN SOUTHERN BOHEMIA

Bratislava PRAVDA in Slovak 13 Jun 85 p 6

[Article by Dusan Brabec: "In the Interest of the Socialist Community"]

[Excerpt] The new South Bohemian Biological Center [JCBC] began its operation last May, thus marking the completion of the installation's first stage. Its work enables us to assess the results of basic research and introduce them into practical use not only in our country but also in response to the needs of the national economies of the other CEMA countries.

The collective of this scientific complex is led by Academician Vladimir Landa, Czechoslovak Plenipotentiary in the CEMA Permanent Working Group. His personality reflects the modern era of Czechoslovak science in the field of biology. In his own description, the task of the center is to participate in the international socialist economic integration. In this connection, Academician Landa noted that the Ceske Budejovice installation has agreements with partner institutes in the Soviet Union on exchange of information and its application and future scientific endeavor within CEMA.

The JCBC staff adopted a joint socialist pledge to fulfill the tasks of the 7th Five-Year Plan, prepare to implement the scientific content of the 8th Five-Year Plan, and make sure that their installation is fully operational by the end of this year.

The significance of some of the new nontraditional forms of cooperation in applied research and practice lies in the establishment of S&T associations between the Czechoslovak Academy of Sciences [CSAV] institutes and industrial branch enterprises. This will provide a programmatic foundation for cooperation in the sphere of agriculture.

The CSAV Entomological Institute deals with problems of insect infestation, as part of the CEMA Permanent Working Group agenda. This includes development and function of insect organisms and reproduction which are governed by ecological consideration.

International scientific cooperation also deals with problem no 12 on the agenda of the Permanent Working Group, i.e., research on new pesticides, biological and other methods of plant protection, and the impact of pesticides on the environment.

It is precisely in this area that JCBC, as well as our agricultural production organizations, cooperate with the CEMA Permanent Working Group. Research and findings on plant protection and impact of pesticides on the environment are concentrated in cooperation with the Mir agricultural cooperative in Chelcice, district Strakonice, the South Bohemian State Forests, and State Estates Sumava.

Cooperation with these enterprises began back in 1981, when research facilities of the above three organizations started their consolidation in Ceske Budejovice. During that time the institute, in cooperation with production partners, succeeded in introducing several methods of biological plant protection, prognosis, and warnings of harmful infestation in the fruit industry and elsewhere. All these results are weighed and checked against the experiences of the Plant Protection Institute in Leningrad, and the Plant Protection Institute in Kichinov (Moldavian SSR). Also significant is JCBC's cooperation with the Pukhchin biological center near Tula. Our scientists regularly visit the scientific town of Serpukhovo to exchange research findings.

The task of the other JCBC institute is parasitology, to gain theoretical knowledge broadly useful in both veterinary and human medicine. Its worksites are handling 3 tasks of the CEMA Permanent Working Group, namely, research on the parasite-host relationship, environmental factors in diseases, and the epidemiology of parasite zoonosis. The institute is testing repellents against blood-sucking flies. In cooperation with the specialized institutes of the USSR Agricultural Academy, the institute developed a diagnostic system of determining toxoplasmosis. The results are applied in some of the Central Asian Soviet republics, in the CSSR, Hungary, Bulgaria, and also in Vietnam, Mongolia and Cuba. Other successes include determination of the protozoary origin of the mass destruction of kacice pyzmove [unknown], and the harmful effects of hydromelioration surface adjustments of water flow enhancing blood formation in blood-sucking flies.

The JCBC's third element is the CSAV Ecological Institute which researches the formation and protection of natural environment, especially the disruption of natural structures, biological cycles and natural balances caused by human endeavor. It is thus gaining valuable information for the best possible approach by individuals and society to their natural environment. All its worksites are participating in the CSAV long-term project "Ecological Management in the CSSR." The institute exchanges its findings with partner institutes in the USSR, GDR and Hungary. It responds to requests for advice and expert analysis. It cooperates on a continuing basis with the Mir agricultural cooperative in Chelcice, the Dubna cooperative, State Estates Sumava, and state fish enterprise JIVAK. Recently, the institute's scientific teams prepared a collection of new data on respiration as a mechanism for self-cleansing of the water ecosystems.

9496

CSO: 2400/509

CZECHOSLOVAKIA

STRESS ADAPTATION STUDIED

Prague RUDE PRAVO in Czech 19 Jun 85 p 4

[Article by Marek Jensik: "What Man Can Tolerate"]

[Excerpt] According to specialists, handball is one of the toughest and physically most demanding collective sport; it stands to be compared perhaps even with ice hockey. It is, therefore, no accident that one of the departments of the Physiological Institute of the Czechoslovak Academy of Sciences is focusing its research largely on a specific handball team.

At Brandys nad Labem, on the left bank of the river directly below the castle, not far from a former malt factory which had already been visited by the emperor of France Josef II--in other words, in areas where one would least expect it--a detached branch of the institute has been functioning for 4 years and is conducting research in the adaptation of man to stress. Old economic buildings and trailers, which we are more likely accustomed to seeing on construction projects, house fine and sophisticated instruments to measure the pulse rate, blood pressure, temperature and other functions of our organism. However, in the immediate vicinity, a bridge connecting Brandys with Stara Boleslav is being built. After the opening of a new sector of highway which bypasses the twin cities, the area has far less traffic but it is enough for a heavy cargo vehicle to go by to threaten the accuracy of the results. The foundations of the building which houses the instruments shakes right along with the bridge.

People from various professions work here; in addition to physiologists, psychologists and sociologists, there are also technicians who service the instruments. They designed or adapted several of them themselves. All in all, this collective is made up of approximately 10 people.

Activities here are thoroughly coordinated within the practiced teamwork of individual scientific specialties. In conferences (and not only during conferences) they agree on how to proceed. This facility houses a sociological, psychological and physiological laboratory so that the test subject is actually observed from three angles at one time. This method of work is intended to eliminate the possibility of one-sided conclusions.

Here, everyone is a specialist in his specialty but altogether form a team of fired-up enthusiasts who support each other mutually and do not permit themselves to be limited by the scope of their duties.

Top athletes (and aviators) cooperate in the research--in other words, people who are exposed to extreme stress. The results are of significance not only in determining doses of training for athletes but are utilized within the framework of the Intercosmos Program to diagnose stress situations under conditions of weightlessness. It is possible to examine the possibilities of man under conditions of maximum stress, to check on his physical and psychological status, his reaction to various stimuli, the influence of his social standing upon the entire situation, etc. Here, the results of research already go far beyond the framework of sports because it is possible to apply the findings in selecting individuals for physically and psychologically demanding activities or for maintaining safety and hygiene in the workplace.

The chief of the Brandys work site, Dr Jaroslav Sykora, says: "We are not concerned merely with increasing man's efficiency but primarily with protecting his health. This is a matter of determining where the actual upper limits of our possibilities lie."

In view of the demanding nature and the importance of the research tasks, this small collective also cooperates with many organizations and institutions. These are, for example: the Department of Psychology at the Philosophical Faculty of Charles University, the Faculty of General Medicine at Charles University, the Department of the Morphology and Zoology of Domestic Animals at the Advanced School of Agriculture in Brno, the Section for Science and Research at the Center for Peak Sports at the Ministry of National Defense, as well as several health care facilities in various corners of our republic.

Although the work site of the Physiological Institute at Brandys nad Labem, which studies man's adaptation to stress, examines primarily handball players it will share in future flights into space, even though only in small measure.

5911

CSO: 2400/528

CZECHOSLOVAKIA

ACADEMY COOPERATES WITH INDUSTRY

Prague RUDE PRAVO in Czech 19 Jun 85 p 4

[Article by Stanislav Stibor: "Sources of Progressive Designs and Methods"]

[Excerpt] The activities of the Czechoslovak Academy of Sciences (CSAV) over the past 2 years were specifically influenced by the conclusions of the 8th Session of the Central Committee of the CPCZ on scientific and technical development. The influence of these provisions was manifested in an interest in more consistent utilization of efficient forms of collaboration at institutes and other CSAV work sites with organizations engaged in communal practices. To support the work connected with securing and methodically managing this cooperation, an independent section was set up in January 1983 in the office of the CSAV Presidium, was expanded by 1 January 1985 and given department status which oversees the realization of the intentions of agreements covering cooperation with individual sectors and with economic production units and follows and evaluates their results.

Framework-type agreements by the academy with decisive sectors and economic production units play an important role in managed cooperation. They make it possible to hand over and apply the results of basic research in practice and to orient research work to the needs of social development in an organized and more consistent manner than heretofore. The agreements are not formal but as experience has shown, particularly with the oldest of them, which were signed between the academy and today's Skoda Enterprise some 20 years ago, are a significant instrument for raising the efficiency of collaboration, contribute to the mutual division of labor and to ongoing control with regard to solving of tasks. Therefore, in recent years, emphasis was placed on the development of these forms and the CSAV now has signed contracts regarding cooperation with 17 sectors and central offices and 14 economic production units. In addition, work sites of the academy enter into operational agreements regarding technical assistance by production organizations, on the basis of which they readily and rapidly help to solve important problems involved in scientific-technical development. Fulfillment of these agreements brings very good results. Within the framework of the agreement involving the Skoda Enterprise, the solution of problems involved in the development of new design materials is significantly shared in by the Institute of Physical Metallurgy of the CSAV. The theoretical working out of these problems is not only the basis of development of actual materials but primarily also a foundation for their utilization in

demanding designs of components for steam turbines, for nuclear energy, for high-efficiency heavy-current installations, etc. The Institute of Thermal Mechanics of the CSAV is also participating in experimental verification of turbine cascades being conducted at the Skoda plant. The results of this work are utilized in 500-MW and 200-MW turbines, as well as in proposing 1,000-MW turbines. Cooperation with the Skoda Enterprise includes even the Institute for Electrotechnology of the CSAV, whose work is aimed at solving magnetic fields for the proposed 1,000-MW turbogenerator. The result of the work is a computer program, including the general description of providing input data for proposing the design. This same work site provided the Skoda concern even with some theoretical solutions for 1,200-MVA transformers (three for the nuclear power plant at Temelin).

The Institute for Electrotechnology of the CSAV is also a partner in the CKD Prague Enterprise. Last year, its work was aimed, for example, at the experimental development of a regulating system containing microprocessors and on mathematical-statistical methods for a reliability program which are applied in the high-efficiency 12-kva alternator. Cooperation of the Institute of Thermal Mechanics of the CSAV with the CKD Prague Enterprise was aimed at protecting the main framework of locomotives against the effects of impacts. The task was solved in international cooperation with the GDR and the Hungarian People's Republic and its application should result in saving millions in the operation and maintenance of the Czechoslovak State Railroads.

Cooperation by the CSAV with the General Directorate of Iron Metallurgy is shared in not only by the CSAV work site, primarily by the Institute for the Theory of Metallurgical Processes in Ostrava and the Brno Institute of Physical Metallurgy but also by the Slovak Academy of Sciences. For example, the results of the scientific work conducted by the Institute for Experimental Metallurgy of the Slovak Academy of Sciences are being applied in the East Slovakia Ironworks in the production of 2,850 tons of high-quality sheet metal for the Tatra National Enterprise at Koprivnice to be used in the production of cargo vehicles for extreme climatic conditions in the USSR. In cooperation with the Institute of Experimental Metallurgy of the Slovak Academy of Sciences, theoretical and experimental research was conducted with regard to desulfurization of steel outside of the furnace. Some 2,700 tons of steel were produced whose degree of desulfurization was 0.005 through 0.006 percent of sulfur. It was rolled into 1,200 tons of sheet metal which, in its category, represents peak quality worldwide. Within the framework of the agreement covering cooperation with the Kovohute Economic Production Unit, the Institute of Inorganic Chemistry of the Center for Chemical Science of the Slovak Academy of Sciences worked out a diagnostic method for evaluating the technological status of electrolyzers on the basis of a frequency analysis of the oscillations involved in the terminal current. The developed prototype of the frequency analysis device was successfully utilized in operation and the results show that the developed method can effectively contribute to lowering energy requirements in the production of aluminum.

However, we are not just talking about engineering. The academy shares in the implementation of all goals in 10 decisive areas of scientific-technical development as set forth by the 8th Session of the Central Committee of the CPCZ.

In the sector of fuels and power, for example, it shares not only in extraction problems, in the theoretical research of new sources of energy, including thermonuclear reactions, but also in the operation of various installations. For example, the Institute of Theory and Informatics of the CSAV worked out a set of programs for the dynamic simulation of pipeline networks applicable to pipelines of any extent and composition and for any type of gas. The latest version of this set, which was dubbed Simone, serves to simulate events which are ongoing in the network as a result of control incursions by the dispatcher (changes in the regime of compressor or reduction stations, closing and opening of valves, etc.) or so-called spontaneous events--changes in the amount of materials drawn from the network, pipeline accidents, etc. The set of programs is utilized in the Plynoprojekt National Enterprise, in the Tranzitni Plynovod [Transit Gas Pipeline] National Enterprise computing center and by the Czechoslovak State Gas Dispatching Center. Overall savings resulting from the introduction of the automated system of controlling the gas pipeline system have been estimated at 180 million korunas per year.

Tens of examples of results involving cooperation with enterprises of the Ministry of Industry, primarily with chemical industries, also with enterprises of the Ministry of Agriculture and Food Production, Forestry and Water Management, serve as additional proof that organized cooperation not only results in savings of hundreds of millions of korunas but that it is the only way in which the principle and necessity for close connection between science and production can be fulfilled and the requirements of society can be guaranteed results at a high level.

5911

CSO: 2400/524

CZECHOSLOVAKIA

PUBLIC HEALTH RESEARCH NEEDS SPECIFIED

Bratislava NOVE SLOVO in Slovak 25 Jul 85 p 7

[Article by Docent Dr L. Rosival, doctor of sciences: "To Change the Life Style"]

[Excerpt] In order to maintain the balance between man and his environment in the interest of health it is necessary to formulate the fundamental requirements for this relationship from the broadest possible strongpoints. It can be said that the main problem in the development of society will mostly be energy and sources of nutrition, and the principal directions of development will be chemicalization and urbanization. Over the past 15 years we have witnessed that the degradation of the components of the environment (particularly the air and water) threaten further socioeconomic development in a number of regions and one cannot exclude any seriously negative consequences this may have on the status of health of the population. Consequently, health research which makes it possible to identify problems and propose solutions from the standpoint of the maximum permissible levels tolerated by the organism, particularly of chemical substances, is inevitable in conjunction with solving ecological problems. The principal goal is to halt or at least reduce the current pace of polluting and gradual devastation of all components of the environment and a more active approach toward the formation of the environment.

Despite great successes in the fight against infectious diseases, which are based primarily on the specific improvement of socioeconomic living conditions for the population and on measures taken by the health care organization, particularly the introduction of inoculation, serious problems remain. In this connection, the research project whose goal it is to conduct the epidemiological analysis of topical infections is important. These diseases include mostly acute respiratory and blood infections, infectious kidney inflammation and nasocommunal infections (an infection which the patient contracted during a stay in a hospital), the modernization of investigative methods and the preparation of rational approaches in the diagnosis, prevention and antibiotic policy applicable in curing infectious diseases.

The fundamental factor affecting the health of the current and future generation is human reproduction and a healthy development of the child population. Here, it is the task of research to determine how various positive and negative factors influence the human organism, to uncover the beginning phases of some

chronic diseases afflicting adults which frequently have their beginnings before birth or in early childhood. A recognition of the factors which influence subsequent physical, mental, emotional and social development of children and young people will make it possible to introduce more effective diagnostic and therapeutic methods and to develop new preventive approaches.

Diseases of the heart and blood vessels, which cause more than 50 percent of the deaths attributed to all diseases, have an all-societal significance. Consequently, research which clarifies the development of arteriosclerosis, dwells on the prevention of its further development, and concentrates on the early recognition and intensive therapy involved in all its manifestations, is very important. Personal attention must be devoted to risk factors and, particularly, to increased blood pressure, smoking and the level of blood lipids. On the basis of experiences in selected regions, a nationwide registry of "high-risk" persons should be established and these persons subjected to systematic preventive therapy. If the introduction of preventive and therapeutic measures is successful on a mass scale, this should show up around the year 1990 in a decline in the incidence of gross defects in cranial blood vessels and the incidence of ischemic maladies of the heart in younger age groups. As is the case with malignant tumors, an adjustment and change in life style will be required of citizens; we shall have to not only inform them of it but convince them that this change will be reflected in better health and a better quality of life for them.

Analyses of morbidity and mortality with respect to neoplastic diseases show them to be an extraordinarily serious all-societal problem. They are the primary cause of death of women between the ages of 30 and 54 and the second highest cause of death for children between the ages of 1 and 15. Annually, some 45,000 persons become ill with these diseases and more than 33,000 die of them. The number of new cases is rising by 2 to 2.5 percent per year. Therefore, it is particularly necessary to concentrate research upon diagnosis, prevention and treatment of these maladies and to devote extraordinary attention to realizing an all-societal oncological program in practice, as well as to work out proposals for systemwide measures to reduce mortality and morbidity with respect to neoplastic diseases. Of the measures in public health, attention is being focused primarily on the production and utilization of chemical substances where emphasis is being placed on solving the problem of carcinogenic chemicals, the method of nutrition (for example, reducing the consumption of saturated fats and increasing the consumption of high-fiber foods), the need to specifically decrease the consumption of cigarettes and alcohol. In research involving neoplastic diseases, the situation is highly complex and it is currently impossible to anticipate simple solutions. However, modern technology is already making it possible to measure not only very low concentrations of carcinogens but their metabolites in the organism, as well as in foodstuffs, water and in the air and to take effective preventive measures.

This problem is closely connected with the need to research diseases of the respiratory tract which are aimed at tubercular and nontubercular diseases. Despite great successes which we have recorded in the fight against tuberculosis, research and practice must continue to develop maximum efforts to assure

the favorable development of the epidemiological situation. Both in research and in comprehensive health care the problem of chronic diseases (chronic bronchitis, asthma and lung cancer) is serious. For some years now these diseases have occupied the first place in the inability to work, in third place as the cause of death and in third or fourth place as causes of disability.

From the professional standpoint in industry and agriculture, exposure to various biological and chemical agents is assuming prominence; with respect to nonprofessional factors, particularly smoking and, with respect to children, air pollution, predominate. From the above it can be seen that this area of activity in health practice research belongs among the very serious problems of diagnosis, treatment and prevention of disease. Its solution will require the active participation of other sectors and an adjustment in the life style of our population.

In Czechoslovakia the most pronounced aspect of population development, particularly in the past 30 years, is the growth in the number of older people in the overall population. The average life expectancy has risen from 40 years in the year 1900 to 70.5 years in 1960 and has remained on that level since then. In 1980 life expectancy for men was 66.8 years and for women, 74 years. However, along with Hungary and Finland and Northern Ireland we suffer the highest mortality rates among men between the ages of 50 and 70 years of age. With respect to men who are older than 50 years of age, more than 70 percent die of diseases of the heart and blood vessels and of malignant tumors. There is a substantial increase in the number of old women over old men. It can be anticipated that even in the future the "feminization" of old age will be a significant characteristic of aging in this country. It is, therefore, unavoidable that attention be devoted to health care research in this area in close conjunction with the solving of social problems for old people.

Population nutrition must adapt to the ongoing changes within the framework of the civilizational process, the decisive factor of which is urbanization (the regime of work and relaxation, the growth and development of the new generation, the population structure, the development of illnesses related to nutrition, etc.). Consequently, it is desirable for health research to provide the foundation for suppressing and limiting those environmental factors which have their origin in the consumption of foodstuffs or elsewhere and to direct development of food consumption in such a way as to utilize the protective function of alimentation in the broadest meaning of the word.

The assurance of these research goals presupposes the introduction of modern computer technology, the high level of scientific-technical information which become a limiting factor in the development of health research. Also, the integration of health research is unavoidable because today it is dependent upon at least six other sectors, a fact which weakens its effectivity in practice.

And the joining of our research into the socialist division of labor is of extraordinary significance.

CSSR RESEARCH COOPERATION WITH CEMA COUNTRIES

Bratislava NOVE SLOVO in Slovak 25 Jul 85 p 9

[Article by Academician Anton Blazej: "Along the Principal Directions"]

[Excerpt] Czechoslovak science represents approximately a 1-percent share of the results of world science and can thus not cover all basic priorities of its development and additionally cannot even form focal points of innovation for all priority areas of scientific-technical development in Czechoslovakia. Consequently, our joining in international cooperation in this area, particularly with the USSR and the other socialist countries, is a very important task. Given a suitable choice of participation and the correct orientation, research can make a significant contribution toward speeding up innovation activity and toward the dynamism of innovation, as well as toward raising the national income through the medium of intensification factors.

In the area of scientific-technical cooperation, it is possible to note that our collaboration with CEMA countries in basic and applied research has further intensified and expanded during the present 5-year plan (we are collaborating in 3,000 research and development tasks). The change is being made to even higher forms of cooperation. While during the period 1981 through 1982 foreign trade enterprises concluded only 36 contracts pertaining to scientific-technical cooperation, a decisive change took place in 1982 when the number of agreements rose to 166. Contractual cooperation is at a good level with the USSR and with the GDR.

New tasks aimed at intensifying cooperation between CEMA member states were set at last year's economic conference of CEMA member states at the highest level. The conclusions of this conference, which were summarized in the Proclamation on the Principal Directions of the Further Development and Deepening of Economic and Scientific-Technical Cooperation Between CEMA Member States as well as in the declaration of CEMA member states entitled "The Maintenance of Peace and International Economic Cooperation," show that the realization of these tasks will have a key importance for the further dynamic development of the states of the socialist community. A new step in intensifying the integrational ties between member states of CEMA is represented by the agreement on coordination of economic and scientific-technical policy. The tasks set by the economic conference organically follow the successes attained by CEMA member states in the past period. Attention and efforts for the

future are aimed at a universal transformation of the national economies to an intensive form of development.

The growth of the national economies into a large national economic complex of CEMA countries requires the perfection of mechanisms designed to manage the integration processes. We must take integration viewpoints more into consideration even in managing national socioeconomic processes. Every fundamental economic problem ceases to have national dimensions and, consequently, it is essential to take its international aspects into consideration from the standpoint of socialist economic integration. The goal of perfecting the mechanism of integration is to increase the efficiency of cooperation, to strengthen the incentives for individual countries in developing the integrational processes, to increase the binding nature of adopted provisions and to deepen the sense of responsibility for failures to fulfill or for the inadequate fulfillment of pledges or adopted measures. It will also be necessary to perfect the formation of prices as well as hard currency-financial instruments and product-monetary relationships. It looks like it will also be desirable to amend organizational, methodological principles and legal standards which no longer correspond to the conditions and goals of integrational processes.

It will also be necessary to press for a more efficient common and coordinated course designed to increase the technical independence of CEMA countries from developed capitalist nations, to eliminate any defensive policy and to initiate an offensive course of action designed to speed up scientific and technical development with the goal of mastering peak techniques, progressive technology and a high quality of production.

Czechoslovakia is approaching the preparations for the "Comprehensive Program of Scientific-Technical Progress of CEMA for the Next 15 to 20 Years" which will be the basis for a coordinated and sometimes unique scientific-technical policy, with great initiative.

Five priority directions of scientific and technical development have been determined: the electronification of the national economy, the comprehensive automation of elastic automated production systems, the accelerated development of nuclear energy, the development and utilization of new types of materials and technology and the area of biotechnology.

In realizing this long-term strategy of scientific-technical development we must create an optimal space for so specialized a profile of the Czechoslovak economy to help us create a profile of our scientific research base to such an extent that we will create an adequate proportionality between the scientific-technical potential and the program of specialization and cooperation for Czechoslovak production. Simultaneously, it will be necessary to purposefully orient a portion of the scientific, technical and economic potential toward collaborating with nonsocialist countries from the standpoint of active scientific and economic contacts with capitalist and developing countries.

The focal point of our scientific and technical collaboration lies in the principal directions specified in the recently signed long-term program of economic and scientific cooperation with the Soviet Union through the year

2000. This program requires a qualitatively new phase in mutual cooperation between Czechoslovakia and the USSR. Similar programs are being prepared involving the other socialist countries.

In the area of basic research, it is desirable for workers of the Slovak Academy of Sciences and of the advanced schools of the Slovak Socialist Republic to join more intensively in existing international programs in the following areas:

- i. the Interkosmos Program for research and the peaceful utilization of space. With regard to long-distance investigation involving the earth, it is the possibility of researching deeply located deposits of mineral raw materials and the utilization of "aerocosmic" information in caring for the environment. Participation in the area of new materials, technologically prepared in a state of weightlessness, as, for example, monocrystals of gallium arsenate for photovoltaic cells, new types of alloys and metals, is of equal importance. In the biological sciences there are interesting changes in the structural and functional physiological systems of man;
- ii. the program involving cooperation with the All-Union Institute of Nuclear Research at Dubno, which is oriented toward the problems of the physics of elemental particles and concentrated systems. Its goal is the attainment of original knowledge regarding the microstructure of matter. Interest is also oriented toward the utilization of fast neutron bundles in doing research on materials for fast reactors. Also, orientation toward the biological sciences can result in much that is new and valuable;
- iii. the program for the development and production of scientific instruments and the automation of scientific research assures the availability of top-quality scientific instruments and equipment needed for the development of socialist science and to reduce the dependence on their imports from capitalist countries. Czechoslovak participation extends to the development and production of electron scanning microscopes, nuclear magnetic resonance spectrometers, polarographic instruments, instruments for fluid chromatography, research involving analytical separation methods, including new instrument technology, instruments and equipment for the health sciences, as well as development of problem-oriented systems for the automation of scientific experiments and the creation of an international inventory of algorithms;
- iv. the CEMA program in the area of controlled thermonuclear fusion is oriented toward the theoretical and technical mastery of a new source of energy with the aid of a thermonuclear reactor. Czechoslovak participation is oriented toward the solution of the supplemental heating of plasma in a high-frequency field within a tokamak, as well as the solving of the problem of heating plasma with a laser. Also, it involves the development of diagnostic devices for processes which occur during thermonuclear fusion;
- v. in the biological sciences participation in the Revertaza-onkogen project, which is devoted to the molecular mechanism involved in neoplastic cellular changes, clarification of the origin and development of the neoplastic process and the rationalization of therapy and prevention of neoplastic diseases. It

will be desirable to establish a CEMA center for the genetic manipulation of industrial microorganisms;

vi. Czechoslovak participation in the Intercosmos Program is connected with the CEMA Bionika project and is concentrated upon the research of regulatory and protective functions of the nervous system in the human organism. The goal of this program is to acquire new knowledge for the understanding of the mechanism of physiological regulation and prevention and for curing its defects. New findings are expected regarding biologically active substances, the pathogenesis of toxic neuropathic substances, the regeneration of nerve fibers, the mechanism of pain, the effects of psychopharmaceuticals and neuropharmaceuticals, on the cellular mechanisms involved in the origin of apopleptic diseases and on defects in the regulatory principles involved in the origin of cardiovascular diseases;

vii. in the area of the social sciences it is the ideological fight going on in the contemporary world, as well as the analysis of experiences from socialist revolutions, beginning with the Great October Revolution through the current world revolutionary process and an orientation toward the lawfulness of the economic developments of socialism, the origin and development of the world socialist system, socialist changes in the creation of a developed socialist society, problems involved in the fight for peace and the solution of global problems in the contemporary world.

We must direct our participation primarily to those selected scientific and technical development problems whose successful solution will speed up the structural changes in our national economy, will contribute to the intensification of economic development and will specifically influence productivity, quality and social efficiency. This will involve multilateral or bilateral cooperation, for example, in the project entitled "Geosynclinal Process and Formation of the Crust of the Earth," whose goal is the working out of a general model of the composition and development of the crust of the earth as a theoretical basis for the origin and distribution of mineral deposits. Also, it is the problem of multilateral cooperation in the area of nontraditional forms of energy (solar energy, bioenergy, hydrogen energy, etc.) but also research and development of specialized equipment for nuclear energy or new technology involved in the extraction and beneficiation of ores and coal. A new area is presented by the project involving new metals, new nonmetallic composites with previously determined characteristics and for special technological uses, as well as a project involving new types of special polymers, copolymers, plastics, elastomers and fibrous materials, a project involving research in superconductivity with an eye toward its practical utilization, new technology and technological equipment for microelectronics and optical electronics, as well as problems involved in the new generation of computer systems for the development of cybernetics and informatics, research and development of comprehensive automation with respect to technological engineering processes and technological installations, development of high-efficiency machines, equipment and production lines for decisive areas of the national economy, as well as research into products of low-tonnage chemistry and chemical specialties (additives, medicines, pesticides, etc.) or research of new technologies and catalytic processes in the area of petrochemistry and, last but not least, biotechnological processes involved in the production of protein for human nutrition, production of diagnostic and biologically active materials, biofactors, as well as the cultivation of plant cells and fabrics or the integrated protection of plants.

IMPROVED TEACHING METHODS FOR SCIENCE, TECHNOLOGY

Prague STROJIRENSTVI in Czech No 4, 1985 pp 193-194

[Article by Prof Eng Z. Caha, CSc, Prorector of the Czech Institute of Technology, Prague: "Current Status and Future of the Educational Training Process at Higher Technical Schools"]

[Excerpt] The goal of the educational training process is determined by society in keeping with the level of social and economic development achieved and according to its needs, intentions, and capabilities. The requirements for the quality of graduates, and thus for the educational training process, are formulated in social practices. But specific practices also create specific demands. Usually, however, they do not have a long-term nature. However, the educational training process is a long-term matter and therefore requires a clear concept and a long-range perspective. Such a perspective can be gained only by high-quality, goal-oriented forecasting from which it is possible to derive the basic directions for the development of education and training. For our Czechoslovak conditions, we have such a primary directing document in the Project for a Unified Czechoslovak Educational Training System of 1976. A transformation has been effected in studies at the higher schools in recent years on the basis of this document.

A rapid tempo of scientific and technical development is characteristic for the current period of the scientific-technical revolution. Advancing automation of production and processes make it more and more necessary to apply science to production. Production more and more is becoming an applied science and science a production force. As a consequence of this, science is becoming the main factor in technical progress and the development of social production. There have been earlier revolutionary upheavals in history both in science and in production. But these revolutions up until now never took place simultaneously, were not organically connected, or mutually influenced each other. The characteristic feature of the scientific-technical revolution is that this mutual influencing occurs and that science and production are interdependent so that qualitatively new relationships appear between them. Even though scientific knowledge cannot be transferred to production directly, since science presents the results of its activities in the form of theories and production requires specific, actual, tested and proved technical equipment and technological methods, the cycle of research-development-production is nonetheless continually being shortened, as is the cycle in production

innovations. Literature tells us that in the most progressive fields there are changes in technology over a period of 3 to 5 years. This fact strongly influences the educational training process at the higher technical schools and impresses it with certain characteristic features.

Literature states that the quantity of scientific-technical information in the world doubles every 10 to 8 years. A substantial proportion of this information concerns fields taught at the higher technical schools. A considerable task is thus placed on the teacher at a higher school to master and classify this information, to select from it the most basic, and to create from this an effectively organized system of knowledge. At the same time it is necessary to deal with a natural consequence of this situation, which is the tendency to expand the amount of time for the lesson plans. As a result of a reduction in the time for the cycle of innovations in production by the application of the newest scientific information, a number of technological processes and methods become obsolete relatively rapidly. As a consequence of this, some information in the field also becomes outdated. It is therefore understandable that great attention is devoted at the higher technical schools to the questions of optimizing the length of studies, the lesson plans, and the curricula. But the higher technical schools must react flexibly even to newborn fields of science and technology and introduce new study fields despite the fact that at the time the new field is set up there has not been formulated any social demand for a given number of graduates. These and other influences result in it being necessary to make use of such methods and forms of teaching in the educational training process as will thoroughly teach the students the scientific methods of thinking and independent creative work along with mastery of the system of knowledge. The resources of the educational training process must also be applied to this goal. In order for it to be possible to carry out the demanding tasks of the educational training process, this process must be supported in all aspects.

A basic requirement for good education and training is optimization of the length of studies and the creation of high-quality lesson plans and curricula for the individual subjects. The individual subjects must then be provided with the necessary literature for studies. At the Czech Institute of Technology [CVUT], special attention is given to the question of issuing study guides and textbooks. Thus in the past we succeeded in achieving thorough coverage of all subjects of the students in the first 3 years in all fields with the prescribed extent of study literature. Of course, this does not mean that there are no study guides or textbooks for the majority of the subjects in the higher years. In order to improve the quality and effectiveness of the instruction itself, all classrooms of the CVUT have been equipped with basic teaching equipment, that is, reverse projectors and slide projectors.

Utilization of this equipment forces a teacher to clarify better his pedagogic goals and to adapt the methods of instruction to them. Currently the teachers at the CVUT use tens of thousands of viewgraphs and large slides. In order to support the students' independent work, in November 1983 the faculty of construction, machinery, and electrotechnical studies opened study halls equipped with video tape recorders, IK 80 personal computers produced at the CVUT, and equipment for showing filmstrips. The IK 80 personal computer has been put

into series production under the designation IQ 150. An improved type of IQ 151 computers are being installed in the study halls. At the same time, a television studio for the production of video cassettes with instructional programs was set up in the Research Institute for Engineering Studies. The interest in the study halls is so great that at the electrotechnical faculty, for example, it has been necessary to limit the stay of students in the study halls to 2 hours. In 1984, a study hall for the nuclear and physical engineering faculty was set up and in January 1985 a second study hall was opened at the construction faculty. This proves that this new technology has great importance for stimulating the students to study. This discovery had a substantial influence on the further approach to improving the quality of the educational training process and in establishing the program for the next period.

In the past few years, three experimental terminal classrooms were set up at the CVUT. The experience gained in operating these classrooms showed that it is possible in this way to increase further the quality of the educational training process. In May 1984, therefore, there was a program worked out at the CVUT for including electronics in the educational training process for the Eighth 5-Year Plan. This project requires the construction of a number of classrooms with computer equipment. It involves program oriented terminal classrooms, a central terminal classroom with a local microcomputer network, special classrooms with computer equipment to be used, for example in modeling and simulation of dynamic systems or for automation of design with computer graphics equipment, and classrooms with autonomous work areas with personal computers, including peripherals. The goals of this program of modernizing the educational training process at the CVUT conform to the long-range program of including electronics in the educational training process of the education departments and can be divided into four groups:

a) in the field of educational training, the goal is:

--to intensify the education of specialists trained at the higher schools by maximum utilization of the qualitative properties of computer equipment and to achieve changes in the way they think;

--to intensify the training of specialists trained at the higher schools in a given field by the utilization of computer equipment for a deeper understanding of physical principles and functional properties of technical projects created;

--to lead the students of the higher schools to independent creative work using computer equipment;

--to teach the students to utilize computer equipment to automate calculations, design, construction, measuring, and management of production and technological processes.

b) in the field of science and research, the goal is:

--to intensify the participation of the higher schools in carrying out tasks of social practice in the development and utilization of computer technology;

--to achieve a broad involvement of the students in scientific research activities;

c) in the field of pedagogic research and pedagogic training of higher school teachers, the goal is:

--to construct a center of pedagogic research at the CVUT, as the base higher school, for the utilization of modern audio-visual and computer equipment which would pass on the results of its work to the other schools;

--within this center, to carry out and coordinate research tasks involving the utilization of electronics in the educational training process;

--to create a teaching center for basic and specialized pedagogic training of teachers from Czechoslovak and foreign higher schools in the field of utilizing electronics in the educational training process;

d) in the field of building modern classrooms, laboratories, and study halls, the goal is:

--to create experimental classrooms, laboratories, and study halls equipped with modern measuring, audio-visual, and computer equipment;

--to use scientific methods to confirm their pedagogic effect in the educational training process;

--to work out proven designs for model classrooms, laboratories, and study halls which would serve as examples for other schools.

It will be necessary to utilize all the capabilities and reserves that the CVUT has in order to implement this program and to achieve the above goals in the forthcoming period.

6285

CSO: 2400/507

KEY ROLE OF ELECTRONICS IN INDUSTRY, ECONOMY ANALYZED

West Berlin FS ANALYSEN in German No 6, 1984 (signed to press Nov 84)
pp 63-106

[Paper by Klaus Krakat: "Technological Progress Through Electrotechnology and Electronics"; expanded version of paper delivered at the 10th Symposium of the Research Institute for Inner German Economic and Social Issues, West Berlin, on 22-23 Nov 84]

[Text] Contents

1. The Reinforcement of Economic Growth as a High-Priority Goal
2. New Measures Toward the Achievement of Desirable Technological Progress
 - 2.1. New Appeals by the Party Leadership and the Leadership of the Economy
 - 2.2. The New Legal Regulations
 - 2.3. Examples of Specific State Promotional Measures
 - 2.4. Progress in Technology Through "Socialist Competition"
 - 2.5. Training and Continued Training Programs for Securing the Continued Development and Application of Microelectronics
3. Further Development of Scientific-Technical Progress Through New Products and Technologies
 - 3.1. The Achievements of the Microelectronics Industry as a Point of Departure for Technical Changes
 - 3.2. The Accomplishments of the Data Processing and Office Machine Industry
 - 3.3. Rationalization Through Industrial Robots and Flexible Manufacturing Systems
4. Features of the Development of GDR Electronics Hitherto
 - 4.1. Positive Evaluation of Developments up to Now--Linked, However, With Some Criticism of the Situation Created by Scientific-Technical Progress
 - 4.2. Increased Cooperation With the USSR
 - 4.3. Heavily Export-Oriented EDP Production
 - 4.4. Promotion of the Production of Products Having "Productive Character"
 - 4.5. The Increased Importance of Information Processing
5. Final Remarks Summarizing the Preceding

Technological Progress Through Electrotechnology and Electronics

1. The Reinforcement of Economic Growth as a High-Priority Goal

Starting from the first foundational activities and measures of intensification which came about toward the end of the seventies and the beginning of the eighties, the GDR deems it appropriate, especially on the occasion of its 35th anniversary, to draw up an account of progress to date with special reference to developments in science and technology. Indeed a variety of accomplishments, particularly in the domain of "electrotechnology/electronics," may be pointed out: to an increasing extent microelectronic applications are a characteristic feature of many areas of the GDR economy and have yielded the increases in efficiency which they had aimed at. Both the Leipzig Spring Fair and the Leipzig Fall Fair in 1984 provided clear indications of the changes brought about by electrotechnology and electronics. But also the State Central Administration for Statistics (SZS) was able to announce positive successful developments, especially for microelectronics, in its report "On the Implementation of the 1984 National Economic Plan in Its First Half Year."¹

An attempt was made to demonstrate this improved performance by describing it in terms of progress in the production of selected products in the industrial domain of "electrotechnology/electronics" (compare Table 1). With regard to results which have been achieved in the interim it is being ever more frequently pointed out in the GDR that microelectronics has already led to visible facilitations and tangible changes and that in individual areas of microelectronics the GDR is among those nations determining the present state of knowledge worldwide.² As shown, particularly by the remarks of Honecker at the 9th Congress of the Central Committee of the SED in November 1984, microelectronics continues to be a decisive factor in intensification and thus scientific-technical progress is an important precursor of the economic growth which we seek: "Microelectronics constitutes a decisive link in the chain for the next steps of our economy toward high technology and further enrichment."³ Here, in the words of Honecker, it is the task of the party leadership and the leadership of the economy of the GDR especially "to increase further the scope of microelectronic production," to broaden the spectrum of microelectronic products, to strengthen "the scientific prerequisites to the production of more new-generation microelectronic components" and "in all areas of the national economy to make use of the achievements of microelectronics at a still greater pace than hitherto."⁴ Thus microelectronics will continue during the next 5-year plan period to be the most important factor in intensification and therefore will remain an important element in the economic strategy of the GDR.

2. New Measures Toward the Achievement of Desirable Technological Progress

In order that the economic strategy of the eighties shall be able to guarantee a long-term positive development and activity in the fields of science and technology consistent with planning we have recently set the following policies in motion:

1. a complex of supplementary legal controls has been put into effect in order to secure the further development of scientific-technical progress;

ii. there have been further calls from the leadership of the party and of the economy of the GDR which aim as in previous years at the enhancement of activity in science and industry;

iii. new logically planned measures of support have been established to accelerate the development of science and technology and

iv. various activities of both central and also decentralized institutions have been initiated and, not least of all a propos of the 35th anniversary of the GDR, special competitive commitments of factory collectives have been announced which as a whole are designed to support measures introduced or already effectuated by the state.

2.1. New Appeals by the Party Leadership and the Leadership of the Economy

As had already been the case in previous annual plans, the national economic plan for the year 1984 aimed at increasing production and productivity through intensified use of qualitative factors. Under the existing conditions this amounted therefore, amongst other things, to a demand that the national economic "efficiency of science and technology be significantly enhanced" and that the "time from the inception of research and development studies to full productive use of the results shall be further shortened."⁵ But as in the past also now the "struggle to achieve peak performance" is seen as an indispensable prerequisite to improved national economic performance through science and technology.⁶ Peak performance should be achieved, for example, both with the aid of rationalization devices and also through "higher quality in the products of machine construction and higher quality in electrotechnology/electronics."⁷ It is emphasized here that a "key question" is the need to make the processes of adaptation less time-consuming than hitherto.⁸

2.2. The New Legal Regulations

As far back as 1981 a number of supplementary regulations have been put into effect aiming in particular at the promotion of further developments in science and technology.⁹ We refer here in particular to the following regulations, ordinances and implementation decrees:

(1) "Ordinance Concerning the Specifications Affecting the Tasks of Research and Development--Specification Ordinance of 17 December 1981," in: GDR LEGAL GAZETTE, 14 January 1982, Part I, No 1, pp 1-5;

(2) "First Implementation Decree Regulating the Specifications Governing the Tasks of Research and Development--Specification Ordinance of 23 November 1983," in: GDR LEGAL GAZETTE, 22 December 1983, Part I, No 36, pp 381-386;

(3) "Regulation Governing the Use of Industrial Cost Accounting in Research and Development of 23 November 1983," in: GDR LEGAL GAZETTE, 22 December 1983, Part I, No 36, pp 387-395;

(4) "Regulation Governing Economic General Accounting for Research and Development Tasks and Annual Book Balancing in the Domain of Science and Technology of 23 November 1983," in: GDR LEGAL GAZETTE, 22 December 1983, pp 395-401;

- (5) "Ordinance Governing the Establishment and Use of Capitalization for Science and Technology and the Application of Funds From the National Budget Toward the Accomplishment of Scientific-Technical Tasks in the Productive Areas of the National Economy--Science and Technology Financing Ordinance--of 5 February 1982," in: GDR LEGAL GAZETTE, 4 March 1982, Part I, No 7, pp 150-154;
- (6) "Resolution Concerning the 'Ordinance Governing Work in the Area of State-Contracted Science and Technology' of 18 February 1982--Excerpt," in: GDR LEGAL GAZETTE, 17 March 1982, Part I, No 9, pp 181-183;
- (7) "Law Relating to the Legal Protection of Inventions--Patent Law--of 27 October 1983," in: GDR LEGAL GAZETTE, 2 November 1983, Part I, No 29, pp 284-288;
- (8) "Ordinance Governing Official Procedures Relating to Inventions and Patents for the Purpose of Strengthening Legal Protection for Inventions of 10 November 1983," in: GDR LEGAL GAZETTE, 14 December 1983, Part I, No 34, pp 331-335;
- (9) "Ordinance Governing Obligatory Patent Application and Patent Examination in the Domain of State Quality Control of 1 September 1981," in: GDR LEGAL GAZETTE, Special Publication No 803/5;
- (10) "Ordinance Concerning Obligatory Patent Examination of Products To Be Carried Out by State Quality Control of 1 September 1981," in: GDR LEGAL GAZETTE, Special Publication No 803/5;
- (11) "Regulation Concerning the Establishment and Conservation of the Quality of Manufactured Products of 1 December 1981," in: GDR LEGAL GAZETTE, 28 December 1983, Part I, No 37, pp 405-412;
- (12) "First Implementation Regulation Governing the Establishment and Conservation of the Quality of Manufactured Products--Product Application--of 1 December 1983," in: GDR LEGAL GAZETTE, 28 December 1983, Part I, No 37, pp 412-416;
- (13) "Second Implementation Regulation Governing the Establishment and Conservation of the Quality of Manufactured Products--State Quality Control--of 1 December 1983," in: GDR LEGAL GAZETTE, 28 December 1983, pp 416-420;
- (14) "Ordinance Governing Standardization--Standardization Ordinance--of 15 March 1984," in: GDR LEGAL GAZETTE, 25 April 1984, Part I, No 12, pp 157-162;
- (15) "First Implementation Regulation for the Standardization Ordinance--Regulations Governing the Implementation of Standardization Studies and Governing the Application of GDR Standards and Specialized Technical Standards and Factory Standards Through the Use of Scales of Quality of 15 March 1984," in: GDR LEGAL GAZETTE, 25 April 1984, Part I, No 12, pp 162-164.

Table 1. On the Development of the Production of Selected Products in the "Electrotechnology/Electronics" Area of Industry (Value Data in Constant 1980 Prices)

<u>Product</u>	<u>Unit</u>	<u>1960</u>	<u>1965</u>	<u>1970</u>	<u>1975</u>	<u>1978</u>	<u>1979</u>
Electronic components	Millions of marks	63.3	106.5	430.0	1,066.1	...	1,995.3
Including:							
Semiconductor components	"	...	...	104.7	336.5	...	841.7
Integrated circuits	Thousands	--	--	--	--	...	...
Including:							
Microprocessors	Each	--	--	--	--	2,200 ¹	...
Machines and equipment for data processing and office operations	Millions of marks	133.3	247.7	866.0	1,599.7	...	2,384.8
Including microcomputers	Each	--	--	--	--	...	...
Numerical controls	Millions of marks	--	--	29.3	70.7	...	149.6
Devices and equipment for surveillance, regulation and control	"	92.7	252.2	548.4	909.5	...	1,237.0
Technological special equipment for the manufacture of electronic and electrotechnical products	"	--	--	147.1	179.3	...	...

<u>Product</u>	<u>Unit</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Electronic components	Millions of marks	2,306.7	2,798.3	3,314.4	4,031.1	...
Including:						
Semiconductor components	"	985.6	1,268.3	1,601.0	2,116.0	...
Integrated circuits	Thousands	37,685.0	47,060.0	55,412.0	58,980.0	...
Including:						
Microprocessors	Each	...	...	...	135,000.0 ¹	...

Table 1 (continued)

<u>Product</u>	<u>Unit</u>	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>
Machines and equipment for data processing and office operations	Millions of marks	2,521.2	2,932.7	3,477.9	3,973.6	...
Including microcomputers	Each	3,095.0	...	10,491.0	20,536.0	43,000 ²
Numerical controls	Millions of marks	184.9	299.4	452.2	566.9	...
Devices and equipment for surveillance, regulation and control	"	1,333.7	1,477.9	1,589.2	1,682.6	...
Technological special equipment for the manufacture of electronic and electrotechnical products	"	305.4	343.6	360.8	400.7	...

1 Heinz Wedler, general director of the Erfurt Microelectronics Combine: "Men, Microelectronics and the Advantages of the Planned Economy," interview in NEUES DEUTSCHLAND, 16 March 1984, p 3.

2 Ibid. (data as of March 1984).

The other sources: Statistical yearbooks of the GDR, 1982, 1983 and 1984.

Science and Technology State Plan

Scientific and technological state contracts	Innovations of importance to the national economy which lie outside the domain of state contracts	Central funding for the conservation of labor time, material, energy and for the production of products bearing the quality symbol "Q"	Development goals in the area of research and development potential
--	---	--	---

Fig. 1. Scientific and technological state contracts as a part of the Science and Technology State Plan.

2.3. Examples of Specific State Promotional Measures

Investment Policy:

Investment policy must be recognized as an essential instrument in governing the development of scientific-technical progress. As examination of past development processes has revealed, investment funds were delivered to industry at the expense of other national economic areas.¹⁰ Undoubtedly this was to the profit of such areas of industry as electronics or machinebuilding. Nevertheless, the focal point of systematic investments was also the creation of rationalization facilities. At the 9th Congress of the Central Committee of the SED in November 1984 Honecker emphasized in this connection that: "In a highly developed economy like ours an ever growing portion of investment must flow into rationalization." From 1980 until the first half-year 1984 within the scope of the industrial ministries the fraction of rationalization investments rose from almost 39 percent to more than 54 percent and is continuing to rise."¹¹ With the continuance of such promotion, the creation of rationalization facilities should in this way, in the words of Honecker, develop "into a center of the most modern technology within the combines."¹² In this process a special role is conceded to microelectronics.¹³

State Contracts:

Also in the future state contracts will play an important part in strengthening scientific-technical progress.¹⁴ State contracts are assigned for innovations which are complex and important to the national economy; an example would, in particular, be support for microelectronics. All projects created in this area have been defined in the "Resolution Concerning the 'Ordinance Governing Work in the Area of State-Contracted Science and Technology'" and in an appendix to this resolution.¹⁵ Science and technology state contracts are probably the most important subcomplex of the science and technology portion of the state plan as the latter has been set up (compare Figure 1) by the State Planning Commission in cooperation with the Ministry for Science and Technology and other central state organs. All the projects defined in the science and technology state plan have primary importance for all managerial organizations and economic agencies. This is true not only for the science and technology plans of the ministries and of the district councils but also with respect to the corresponding plans of the combines, factories and research institutions. Such a science and technology plan in which the central state projects are also displayed in detail encompasses various individual plans which are regulated for the currently obligatory 1981 to 1985 5-year plan in the publication "Guidelines for Planning in the Combines and Factories of Industry and Construction," Plan Section 3, "Science and Technology."¹⁶ All tasks defined or to be defined in the individual plans may be found in their definitive binding form in the specification volume for the factory or combine.

The Specification Volume:

As early as 1977 the specification volume for all combines, state-owned factories and scientific facilities has been an obligatory component of planning.

Officially, it is recognized not only as an instrument of planning and management of research and development activities but it also forms the basis for the definition, financing and performance evaluation of innovation processes.¹⁷ Also at the present time within the context of further development of scientific-technical progress a central role is assigned to the specification volume in applying the performance principle.

The Economic and Managerial Organization:

In addition to the already-mentioned examples of ways of influencing scientific-technical development one can also consider the economic organization and managerial organization to be an appropriate means of supporting and implementing state promotional measures in microelectronics.

Thus with the combine reform initiated in 1978 an attempt was made also to adapt the managerial organization and economic organization to the demands of technological development.¹⁸ Although the combine reform had been viewed as completed as far back as 1980 in the following years an attempt was made, for example, in the industrial area of "electrotechnology/electronics," to achieve the best possible combine structures by including new factories in a single combine and/or by the disincorporation of factories.¹⁹ Moreover, very recently there have been announced some organizational changes in the area of electrotechnology and electronics. As one example, the need to meet scientific-technical demands made production expansions unavoidable. In the Dresden Robotron Combine this led to the creation of new production plants. As stated in a recent short announcement, "to take effect as of 1 July 1984," there have been established

i. the Dresden VEB Robotron project as a new "plant for the production of software" and

ii. the Karl Marx City VEB Robotron office equipment as "a plant for technological customer service"

(compare also Figure 2).²⁰

On the other hand in the Erfurt Microelectronics Combine already existing production capacities have been expanded. Thus in Erfurt-Southeast a new plant of the Erfurt "Karl Marx" Microelectronics VEB has been set up in which as of May 1984 integrated circuits are being mass produced.²¹

But changes were also to be observed which aimed at unifying the "inner managerial organization" of combines in the domain of electrotechnology and electronics. In the words of Guenter Mittag at the "Economic Conference of the GDR for the Karl Marx Year 1983," "it is possible for the management of the combines to be conducted in a proven and efficient manner and at diminishing administrative cost through one parent plant. This is a basic principle which holds in all cases. In order for this principle to be put into effect it is also necessary to create step by step the prerequisites required for its application wherever today specific transitional solutions are in practice."²² Such "transitional solutions" were to be encountered, for example, in the

Dresden Robotron Combine and in the Erfurt Microelectronics Combine. At Robotron formerly management was via an "autonomous managerial apparatus" and in the Microelectronics Combine the combine plants were managed via three "managerial operations."²³ Since 1 July 1984, adapting to the state guidelines, the Robotron Combine has been managed through a single parent operation, the Dresden VEB Robotron Electronics (compare Figure 2). Corresponding changes were also observable in the Dresden Microelectronics Combine. And at the Leipzig Spring Fair the Frankfurt/Oder VEB Semiconductor Plant was presented as such a parent operation. At the same time the Ruhla VEB Watchworks was, however, still functioning as a managerial operation (compare Figure 3). Then in the course of the year this form of transitional solution has been abandoned in favor of the desired "uniform" organizational approach. It is also expected that in the case of the Jena Carl Zeiss Combine the management of the combine will be conducted through a parent operation so that then in the general area of "electrotechnology/electronics" the parent operation will have been completely realized as the final "fundamental principle" of the "internal" managerial organization in combines (compare also Figure 4).

Keeping in mind the fact that also in the GDR one must expect further developments in microelectronics and that this will affect in particular other industrial branches in the area of electrotechnology and electronics one must assume that the assignment of combines to specific types of production which is still the practice here will very possibly be revised. In particular, in view of the imminent linking of communications engineering and data processing, one must expect changes in economic organization and production organization. The last Leipzig Spring Fair with its collective exposition of the combines in the "electrotechnology/electronics" area of industry had made it indubitably clear that also in the GDR people will be following the international trend toward linking and sometimes even merging specific areas of production.

Key to Figure 2:

1. Dresden VEB Robotron Combine--General Director: Dipl Engr Friedrich Wokurka; Total number of employees: about 70,000
2. VEB Robotron-Electronics Dresden, parent plant
3. VEB Robotron-Electronics Radeberg
4. VEB Robotron-Electronics Riesa
5. VEB Robotron-Electronics Zella-Mehlis
6. VEB Robotron Computing and Typing Dresden
7. VEB Robotron Office Machine Plant Soemmerda
8. VEB Robotron Accounting Machine Plant Karl Marx City
9. VEB Robotron Electrical Switching Devices Auerbach
10. VEB Robotron Goldpfeil Magnetic Head Plant Hartmannsdorf
11. VEB Robotron Optima Office Machine Plant Erfurt
12. VEB Robotron-Electronics and Graphics Devices Hoyerswerda
13. VEB Robotron Measuring Electronics "Otto Schoen" Dresden
14. VEB Robotron Rationalization Weimar
15. VEB Robotron Center for Research and Engineering Dresden
16. VEB Robotron Office Equipment Karl Marx City, Plant for Technical Consumer Service
17. VEB Robotron Project Dresden, Plant for Software Production

(1) VEB Kombinat Robotron Dresden

Generaldirektor : Dipl.-Ing. Friedrich Wokurka
Gesamtzahl der Beschäftigten : rd. 70 000

- (2) VEB Robotron-Elektronik Dresden, Stammbetrieb
- (3) VEB Robotron-Elektronik Radeberg
- (4) VEB Robotron-Elektronik Riesa
- (5) VEB Robotron-Elektronik Zella-Mehlis
- (6) VEB Robotron Rechen- und Schreibtechnik Dresden
- (7) VEB Robotron-Büromaschinenwerk Sömmerda
- (8) VEB Robotron-Buchungsmaschinenwerk Karl-Marx-Stadt
- (9) VEB Robotron Elektro Schaltgeräte Auerbach
- (10) VEB Robotron-Goldpfeil-Magnetkopfwerk Hartmannsdorf
- (11) VEB Robotron-Optima Büromaschinenwerk Erfurt
- (12) VEB Robotron-Elektronik und Zählengeräte Hoyerswerda
- (13) VEB Robotron-Messelektronik "Otto Schön" Dresden
- (14) VEB Robotron-Rationalisierung Weimar
- (15) VEB Robotron-Zentrum für Forschung und Technik Dresden
- (16) VEB Robotron-Birotechnik Karl-Marx-Stadt
Betrieb für technischen Kundendienst
- (17) VEB Robotron-Projekt Dresden
Betrieb für Softwareleistungen
- (18) VEB Robotron-Stahlbau Riesa
- (19) VEB Robotron Vertrieb Berlin (mit Schulungszentrum)
- (20) VEB Robotron-Bürotechnik Dresden
- (21) VEB Robotron Vertrieb Erfurt
- (22) VEB Robotron-Anlagenbau Leipzig
Absatzbetrieb mit Schulungszentrum
- (23) Robotron Export-Import
Volkseigener Außenhandelsbetrieb Berlin

Fig. 2. Organizational structure of the Dresden VEB Robotron Combine.

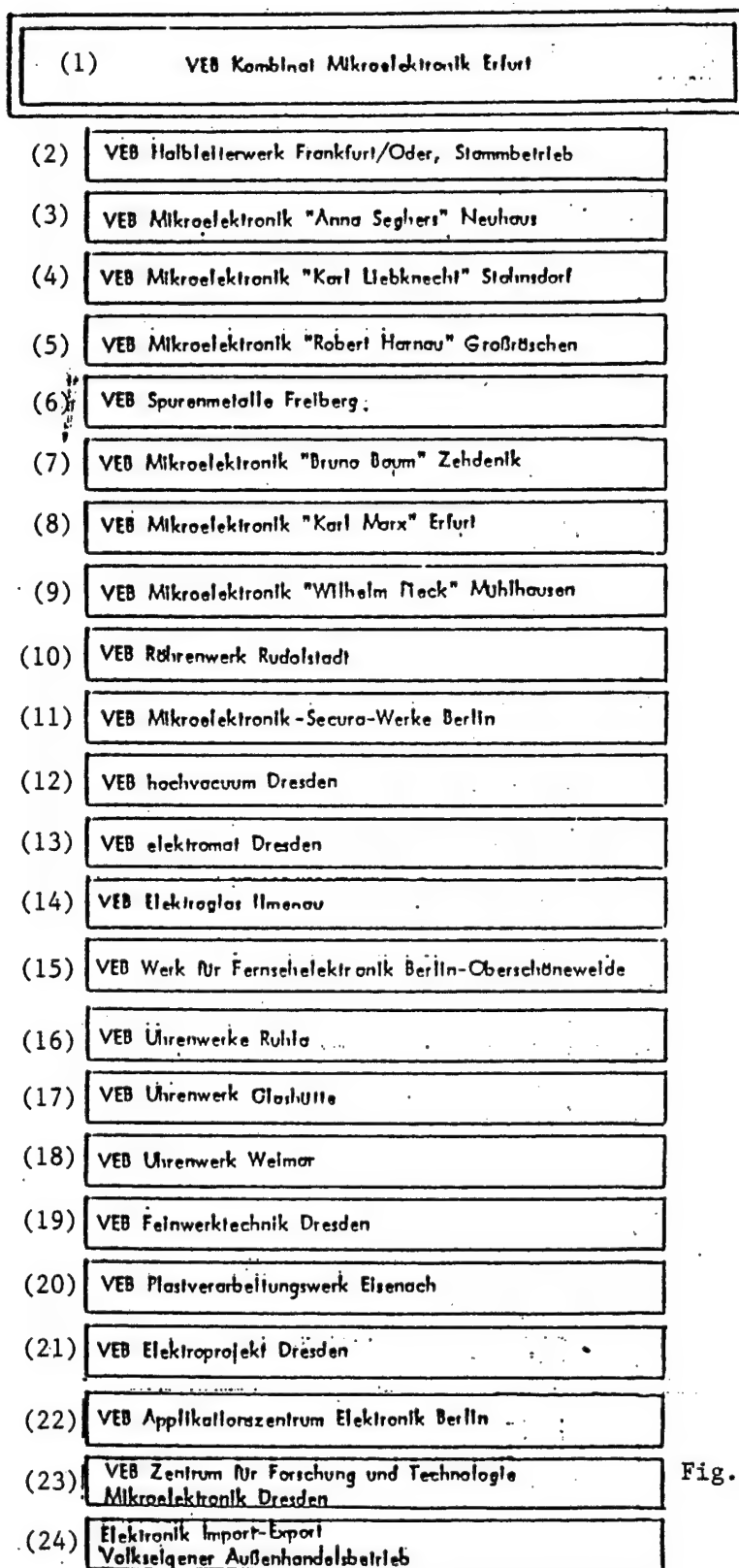


Fig. 3. Organizational structure of the Erfurt Microelectronics Combine.

Key to Figure 2 (continued)

18. VEB Robotron Steel Construction Riesa
19. VEB Robotron Sales Berlin (with Training Center)
20. VEB Robotron Office Equipment Dresden
21. VEB Robotron Sales Erfurt
22. VEB Robotron Facilities Construction Leipzig, Sales Operations With Training Center
23. Robotron Export-Import, People's Foreign Trade Agency Berlin

Key to Figure 3:

1. VEB Combine Microelectronics Erfurt
2. VEB Semiconductor Plant Frankfurt/Oder, parent plant
3. VEB Microelectronics "Anna Seghers" Neuhaus
4. VEB Microelectronics "Karl Liebknecht" Stahnsdorf
5. VEB Microelectronics "Robert Harnau" Grossroeschen
6. VEB Trace Metals Freiberg
7. VEB Microelectronics "Bruno Baum" Zehdenik
8. VEB Microelectronics "Karl Marx" Erfurt
9. VEB Microelectronics "Wilhelm Pieck" Muhlhausen
10. VEB Tubing Plant Rudolstadt
11. VEB Microelectronics Secura Plants Berlin
12. VEB High Vacuum Dresden
13. VEB Elektromat Dresden
14. VEB Elektrogas Ilmanau
15. VEB Plant for Television Electronics Berlin-Oberschoeneweide
16. VEB Watchworks Ruhla
17. VEB Watchworks Glashuette
18. VEB Watchworks Weimar
19. VEB Fine Machining Dresden
20. VEB Plastics Processing Plant Eisenach
21. VEB Elektroprojekt Dresden
22. VEB Applications Center for Electronics Berlin
23. VEB Center for Research and Technology Microelectronics Dresden
24. Electronics Import-Export, People's Foreign Trade Agency

1978-1983/84

Several main forms of internal managerial organization in a combine; combine management through:

A parent plant
Managerial operations
An autonomous combine management

As of 1984

Sole main form of internal managerial organization in a combine; management of the combine through:

A parent plant

Fig. 4. The parent plant as a desirable "basic principle" in the internal managerial organization of a combine.

2.4. Progress in Technology Through "Socialist Competition"

As has been demonstrated in various articles published in NEUEN DEUTSCHLAND, for many plant collectives the 35th anniversary of the GDR has provided a special incentive not only to realize resolutions affirmed by the leadership of the party and of the economy but it has also been an occasion on which to draw up an accounting of work successfully done in what may be called our "economic strategy."²⁴ Now we are already confronting a further incentive toward continuation of the competition in combines and plants "for high economic growth": namely, the 11th Party Congress of the SED in April 1986. According to reports, the "9,000 employees of the VEB Elektroprojekt and Facilities Construction Plant" gave "the starting signal for party congress competition" to the parent plant of the Berlin (East) Automation Equipment Combine on the occasion of the announced call issued by the party congress.²⁵

Over and above these essential contributions to the creation of our economic strategy for the eighties are also seen in the innovations developed and introduced within the context of the "MMM movement."^{26, 27}

2.5. Training and Continued Training Programs for Securing the Continued Development and Application of Microelectronics

Undoubtedly, in recent years the GDR has also entered upon extensive efforts to secure through appropriate training and continued education programs to secure the further development and use of microelectronics. Accordingly, there has been not only an expansion and improvement of the training program for students in the advanced schools and universities but also the combines themselves are increasingly offering their workers internal courses in continued education. One may also mention as a particularly broad spectrum program the training and continued education efforts of the Chamber of Technology.

As the journal DAS HOCHSCHULWESEN in its May 1984 issue reported, the increasing importance of microelectronics has necessitated the "central coordination and guidance" of the continued education process and the founding of a "microelectronics continued education complex" in which "are combined all relevant instruments of education." This involved the working out of a joint continued education program "that at the present time encompasses for the period 1983-1985 about 300 different continued education activities."²⁸

In the schools, too, microelectronics will play a special role in the curriculum: for students of the 9th and 10th classes as of September 1984 facultative attendance at electronics lectures is possible thanks to a new teaching program.²⁹

3. Further Development of Scientific-Technical Progress Through New Products and Technologies

Taking into consideration the developmental situation in recent years it may be stated that especially thanks to the progress achieved in the area of electrotechnology and electronics (i.e., the availability and use of microelectronic products and new technologies) advantage has been gained not only by

industry but also in other so-called "nonproductive" domains. Thus the GDR, despite errors of planning, shortages and problems of innovation, finds itself in a position in this 35th year of its existence to point to a number of changes in its national economy which have been brought about by microelectronics. In the following we intend to show what, among other things, lies beneath the developmental figures contained in Table 1.

3.1. The Achievements of the Microelectronics Industry as a Point of Departure for Technical Changes

The microelectronics industry of the GDR is represented by three combines (compare, too, Figure 5):

- i. the Erfurt VEB Microelectronics Combine,
- ii. the Teltow VEB Electronic Components Combine and
- iii. the Hermsdorf/Thuringen VEB Ceramic Works Combine.

Ministry for Electrotechnology and Electronics (Minister: Felix Meier, as of 1 October 1982)

Erfurt VEB Microelectronics Combine	Teltow VEB Electronic Components Combine	Hermsdorf/Thuringen VEB Ceramic Works Combine
Combine director: Heinz Wedler	Combine director: Wolfgang Langershausen	Combine director: Guenter Wirth
Employees, approx: 60,000	Employees, approx: 24,000	Employees, approx: 23,000
Combine plants: 23 plants, including 19 production plants, 1 center for research and technology, 1 applications center, 1 project planning operation and the People's Foreign Trade Agency (AHB) for electronic exports and imports	Combine plants: 9 production plants	Combine plants: 20 production plants and 1 center for research and technology

Fig. 5. The microelectronics industry of the GDR.

Erfurt Microelectronics Combine, which is the principal arm of the microelectronics industry, views itself as a center of industrial research, development and production for components in microelectronics and semiconductor technology, for technological special equipment and for electronic consumer goods. Accordingly, the present production program of the combine encompasses three

focal areas (compare in addition Figure 6). As stated by the general director of the Microelectronics Combine the "development of microelectronics in the GDR would have been unthinkable without the creation of a special combine involving a closed reproduction process."³⁰ On the basis of this combine the production activities of the two other combines may be seen, as far as microelectronics is concerned, also as a supplement to the production and supply program of Erfurt Microelectronics. In addition, the production program of these combines also includes electronic products which cannot be reckoned as belonging immediately to the category of microelectronics (compare Figures 7 and 8).

On the occasion of the 35th anniversary of the existence of the GDR Wedler attempted with the aid of some numerical comparisons to make clear the magnitude of the achievements accomplished in particular by the Microelectronics Combine during the period of its existence since 1978. According to his account the combine in the year 1978, for example, produced active electronic components having a value of 575 million marks. In 1983 their value rose to 1,724 million marks. Similarly, production of microprocessors rose from 2,200 pieces in 1978 to 135,000 pieces in 1983.³¹ Of the microprocessors produced in the combine, at the present time in the words of Wedler "over 90 percent consist of products in the area of data processing and computing and office equipment as well as products in the area of control, regulation and automation technology."³² Among these may be reckoned also the U 808 D, an 8-bit microprocessor for microcomputers in p-channel technology and the U 880 D, an 8-bit microprocessor in n-channel technology. This spectrum of products was augmented by the addition of the 16-bit microprocessors U 8001 D and U 8002 D which were for the first time exhibited at the 1984 Leipzig Spring Fair. According to information issued at the fair mass production of these latter will begin at the end of 1984 or the beginning of 1985. One might also consider the three 8-bit single-chip microcomputer families to be an important addition to the production of active electronic components. These and other new active and passive components were also exhibited in Leipzig.³³

Active Electronic Components

Semiconductor components

- Integrated circuits (e.g., microprocessor systems and single-chip microcomputers)
- Optical-electronic components
- Transistors
- Diodes
- Rectifiers
- Components for fiber optics light transmission

Electron tubes

- Photomultipliers
- Display tubes
- X-ray tubes

Fig. 6. The production program of the Erfurt VEB Microelectronics Combine.

Special Equipment and Special Products

Special equipment

For example, devices for microlithography and high-vacuum technology,
visual control devices and devices for bonding technique

Special products

For example, electrical insulating material
Semiconductor materials/[illegible]
Housing components
Housing for integrated circuits
Quantity computer [illegible] (scientific-technical [illegible] for
quantities and dimensional units)

Consumer Goods Electronics

Watches, including LCD quartz wristwatches, quartz alarm clocks, chess
clocks, meteorological devices, including barometers, hygrometers, polymers

Videogames

Chess computers (SC 2 and "Chess Master")

Teaching computer LC 80 (single-card microcomputer)

Home computer HC 900

Electronic pocket calculators and minicalculators (MR series)

Fig. 6. (continued) The production program of the Erfurt VEB Microelectronics Combine.

Passive Electronic Components

Condensers

Switches and keys

Printed circuits

Resistors

Plug-in connectors

Frequency selective components

Special components (among others, mechanical frequency filters)

Fig. 7. The production program of the Teltow VEB Electronic Components Combine.

Insulating bodies and insulators for apparatus and open-air transmission lines for maximum voltages

Electronic components for radio, television, communications, measurement, control and regulation technology and for data processing (hybrid switching circuits)

Apparatus and facilities constructed of glazed porcelain and stoneware for the chemical industry and related industries

Highly wear-resistant, high temperature-resistant, corrosion-resistant oxide-ceramic products capable of resisting maximum electrical stress and used in the most varied branches of industry

Insulating components and components for electrotechnology, for gas apparatus, heating apparatus and illuminating apparatus as well as antiarcing devices for switching equipment

Components and elements in high-frequency technology, substrates for carbon lamina, metal lamina and wire resistors, system supporting frames and ELKasin brackets for cathode ray tubes

Sintered metallic contact elements and current-carrying elements, components for vacuum tube technology, super-heavy metals as screening material for gamma rays

Insulated spark plugs for Otto engines in all thread sizes and thermal values, racing spark plugs and special spark plugs and other specialized products (electrical heating rods)

Fig. 8. The production program of the Hermsdorf/Thuringen VEB Ceramic Works Combine.

To the new mass production products exhibited for the first time in 1984 by the Microelectronics Combine we must also add, besides components, the HC-900 home computer as well as special equipment (compare also Figure 9). It is true that both the HC-900 home computer and also the chess computer, as it is called, are already obtainable commercially,³⁴ but one must assume that such devices at first will be available only for a very limited group of users. This group would, for example, include such categories as institutes in advanced schools, in combines and training centers in combines and the Chamber of Technology.

Over and above this, advanced schools and research institutions have made a contribution to continued development in microelectronics itself and in its applications. Thus, for example, a "graphics-capable modular microcomputer system" was developed at the "Otto von Guericke" Advanced School in Magdeburg and displayed for the first time at the 1984 Leipzig Fair. The Ilmenau Technical Advanced School has produced a newly developed precision laser dilatometer. And the Technical University of Dresden has exhibited new developments in Leipzig. Other new products have had their origin in research and development efforts by various specialized institutes of the Academy of Sciences. Altogether it may be asserted on the basis of the current status of developments that the achievements of the microelectronics industry in the GDR have also left their impress on the production program of the combines and people's factories of other industrial domains and branches. Amongst others may be mentioned here:

- i. the data processing industry and office machine industry,
- ii. the automation equipment industry,
- iii. communications engineering,
- iv. the radio and television equipment industry,
- v. electrical machine construction,
- vi. apparatus construction (microlithographic equipment, medical-technical products, astronomical equipment, etc.),
- vii. machine construction generally,
- viii. the textile industry and
- ix. the chemical industry, etc.

HC 900 Home Computer

Manufacturer	Muhlhausen VEB "Wilhelm Pieck" Micro-electronics
Form of product	Basic equipment in mother-board construction with integrated power supply and separate keyboard
Basic circuitry	8-bit microprocessor U 880 D
RAM	32-K bytes (of which 16-K bytes are freely available for use)
ROM	4-K byte (ROM)
Language	BASIC, U 880-assembler
Keyboard	64 alphanumeric keys
Display unit	Commercially available television monitor (color or black-and-white)
Video interface	UHF connection, RGB connection
External connections	Connection for cassette recorder, expansion interface
Expansion possibilities	Inter alia, joy stick, light pencil, BASIC interpreter, 16-K bytes RAM and 64-K bytes RAM
Mass production	As of fall 1984, on the market as of October/November 1984

Fig. 9. Facts about some new products from the Erfurt Microelectronics Combine.

Chess Computer CM (Chess Master)

Manufacturer	Erfurt VEB "Karl Marx" Microelectronics
Basic circuitry	8-bit microprocessor U 880 D
Chessboard	Sensor board
Levels of play	8
Analysis levels [?]	4
Mass production	As of mid-1984

qpc-2 Quantitative Computer, Computer for Quantities and Measurement Units

Basic circuitry	8-bit microprocessor U 880 D
Keyboard	Alphanumeric
Form of product	Supplied in two variants: <ol style="list-style-type: none">1. As nonprogrammable scientific-technical quantitative computer (20 basic commands)2. As a programmable scientific-technical quantitative computer (4 modes of operation, 12 control commands, 22 basic commands)
Developer	Berlin VEB Electronics Applications Center

Manual Wire Bonder MDB 20

Designer/manufacturer	Dresden VEB Microelectronics Center for Research and Technology
Control	Via fixed program CMOS-automation or manually
Use	Universally, for producing thermocompressive and thermosonic contacts

Visual Control Station SKP 01

Designer/manufacturer	Dresden VEB Microelectronics Center for Research and Technology
Control	By microcomputer
Data output	By monitor screen
Data storage	On magnetic tape cassette
Data output	By thermal printer

Fig. 9. (continued) Facts about some new products from the Erfurt Microelectronics Combine.

3.2. The Accomplishments of the Data Processing and Office Machine Industry

The data processing and office machine industry of the GDR is represented by a single combine, the Dresden VEB Robotron Combine (compare Figure 2). In the Robotron Combine in addition to data processing and office technology products

there are also manufactured products in the area of electronic entertainment as well as equipment for measurement technology and radio direction-finding technology (compare Figure 10 for the details). This production program is being augmented by the following additional items:

- i. system software, standard software and branch software for use with Robotron EDP hardware;
- ii. training programs;
- iii. project planning, design and consultation as well as
- iv. licensing.

Ever since the introduction of the first product arising from the program of decentralized data technology in 1980³⁵ and their production, Robotron has steadily expanded and improved its output in this particular sector. In the meantime about 43,000 microcomputers have been in use (as of March 1984)³⁶ in the most varied areas of the national economy of the GDR. This involves the following types of microcomputer:³⁷

- i. the freely programmable microcomputer system Robotron ZE 1 (solo product group) with the 8-bit microprocessor U 808 D (from the Erfurt Microelectronics Combine);
- ii. the Robotron K 1510 microcomputer system (basis: 8-bit microprocessor U 808 D);
- iii. the MPS 4944 microcomputer system (modular microcomputer system consisting of three CPU cards: U 808 D, Intel 8008 and Intel 8080 or Zilog Z 80), developed at the Central Institute for Nuclear Research in Rossendorf in the Academy of Sciences of the GDR with the cooperation of other academy institutes, of advanced schools and of industry;
- iv. the Robotron K 1520 microcomputer system (basis: 8-bit microprocessor U 880 D from the Erfurt VEB Microelectronics Combine);
- v. the Robotron K 1600 microcomputer family with the Robotron K 1610 as its basic products group system (OEM variant)³⁸ and the two systems Robotron K 1620 and K 1630 with different performance capabilities (system basis: 8-bit microprocessor U 830 from the Erfurt Microelectronics Combine).

The microcomputers not only constitute the core of basic computers and office computers. They are also involved in terminal systems and in machine tool controls and industrial robot controls. Finally, microcomputers are an essential part of the CAD/CAM workplaces exhibited by Robotron for the first time at the 1984 Leipzig Spring Fair.³⁹ But as was emphasized by way of caution at the fair we find ourselves in this sector only at the beginning of a new stage of development, especially in comparison with those Western industrial countries which are leaders in this area.

"Data Processing and Office Equipment" Product Group

Universal computers (ESER installations and ESER peripheral devices)
Microcomputer systems
Basic computer systems, office computers, process computers including associated peripheral devices (monitors and terminals, printers, etc.)
Electronic writing systems and text systems
CAD/CAM workplaces
Devices for automatic speech recognition and speech output
Personal computers and home computers
Writing machines (mechanical, electrical and electronic)
Graphics facilities and organization aids

"Electronic Measuring Technology" Product Group

Sound measuring and vibrations measuring technology
Nuclear radiation measuring technology
Devices for locating cable defects

"Radio Direction-Finding Technology" Product Group

Radio direction-finding technology for stationary and transportable direction-finding equipment

"Entertainment Electronics" Product Group

Monaural home receivers
Portable television sets
Compact stereo sets

Production Rationalization Equipment (for domestic and foreign market)

PHM 41 industrial robot, process-flexible articulated robot
Electronic components for television and typewriters
Integrated circuits for electronic data processing installations and microcomputers

Fig. 10. The production program of the Dresden VEB Robotron Combine.

It is a characteristic feature of the growth of microcomputer technology in the GDR that for some time it has moreover encompassed the so-called "nonproductive" areas. Thus, for example, Robotron microcomputers are used in bank terminals and the terminals of savings institutions (also Robotron products). These terminals have for some time been employed increasingly in banks, savings institutions and in the GDR postal system. Microcomputer systems can also be used in business in the context of various modes of application and it is believed that they can provide substantial increases in efficiency in transport also.⁴⁰ For some time now microcomputer systems have been used in the health area in the GDR,⁴¹ for example, in scheduling irradiation (DOPSY Robotron, interactive irradiation system for radiation therapy), for the description of X-ray observations (Robotron-MARMEDO with the K 1520 microcomputer) as well as in obstetrical surveillance (microcomputer system K 1520 in

the Robotron-NATALI obstetrical surveillance system). Over and above this Robotron furnishes special client assistance in computer technology in the area of health.⁴²

Home computers are also being manufactured of late in the GDR to keep abreast of international developments.⁴³ As was reported already in January 1984 in the SAECHSISCHEN ZEITUNG, for the year 1984 the production of a total of 500 home computers in the Robotron Combine was planned.⁴⁴ At the Leipzig Spring Fair there were exhibited not only the Robotron home computer under the model designation Z 9001 but also the HC-900 home computer of the Erfurt Microelectronics Combine as well as a first personal computer designated Robotron 1715 (compare Figures 11 and 12). With an eye to future development of ESER [for expansion see Figure 15--tr.] computer technology the GDR, in a comparison with the other CEMA countries, has also been able to chalk up some of its own successes. In 1981 at the Leipzig Spring Fair in the ESER computer system EC 1055 M there was displayed an improved version of the EC 1055 computer (computer system of development series 2 for the "uniform system of electronic computer technology" (ESER)). This new computer, together with improved and compatible peripherals and software, forms with microcomputer technology an essential constituent of the data processing technology produced and supplied by Robotron Dresden (compare also Figure 10). In the meantime the EC 1055 M computer system has also been further developed. As has been announced in the August issue of the journal RECHENTECHNIK/DATENVERARBEITUNG "the development collectives of the VEB Robotron Combine have fulfilled the obligations which they had entered into in honor of the 35th anniversary of the GDR, namely to jointly test the newest GDR ESER model." Before a panel of experts from the countries participating in the ESER they defended their new development, the EC 1056 computer, as a "contribution of the GDR to the 'sixth series' of models of the ESER."⁴⁵ In contrast to the preceding models (EC 1055 and 1055 M) the EC 1056 displays "a number of improvements."⁴⁶ For its maximum operation speed a figure of 505 TOp/sec has been mentioned.⁴⁷ Thus it may be assumed that mass production of this new computer will begin in the course of 1985 and at the same time production of the EC 1055 M will be terminated.

3.3. Rationalization Through Industrial Robots and Flexible Manufacturing Systems

Like microelectronics, so, too, industrial robot technology is among those "structural political focal points" to which the party leadership and the leadership of the economy of the GDR will be devoting special attention from now on. With regard to its current development, the particular status of the robots installed may be supplemented with additional new data (compare Table 2). By the middle of 1984 in the GDR, according to information in the press there were about 35,000 industrial robots in use.⁴⁸ At an industrial robot exhibit organized in October 1984 by the district leadership of the SED in Karl Marx City information of a comprehensive nature was for the first time available with regard to the current status of development and use of industrial robots in the GDR and the importance of these robots for the development of the national economy. With about 100 practical examples there were demonstrated to visitors to the exposition the widest range of possible uses of industrial robots. As reported, "50 combines and factories offered their best

engineering for application in this field."⁴⁹ Not least of all at this robot exposition it was made clear that in the GDR the trend in robot production is toward a central manufacture of design series and components. The particular governing idea here was that such design series and components may be adapted with relative ease to the existing conditions of production in the factory and are thus largely universal in their possible application. "Model uniformization" and "standardization" therefore must also be seen in this sector as new goals of development.⁵⁰

For the end of 1984 one may assume a final inventory of altogether 42,700 robots if the 1984 annual plan target of 11,700 robots is accomplished.⁵¹ It is known that according to the long-term plans reaching to the end of 1985 there should be available a total of 45,000 industrial robots. If one assumes that on the average 2.5 workers will be released for each robot installed then the potential savings in labor would amount to as much as 112,500 workers.⁵²

Table 2. Development of the Inventory of Industrial Robots Installed in the GDR

<u>Date of Use</u>		<u>Actual Inventory</u>		<u>Target Inventory</u>	
		<u>a</u>	<u>b</u>	<u>a</u>	<u>b</u>
1980	Beginning	160	--	--	--
	December	220/320	--	--	--
1981	Beginning	--	4,500	--	--
	November	--	9,200	--	--
	December	--	13,000/13,680	--	--
1982	June	--	15,000/16,500	--	--
	August	370	17,862	--	--
	December	--	21,900/22,418	--	--
1983	June	--	26,000	--	--
	September	--	27,000	--	--
	December	--	32,117	--	30,700
1984	April	--	34,000	--	--
	July	--	35,000	--	--
	December	--	--	--	43,700
1985	December	--	--	--	45,000

Inventory data according to GDR sources:

Because of the difference in definition of the term "industrial robot" as used in the GDR and in the Federal Republic of Germany the robot inventory figures published in the two countries cannot be compared with one another.

Supplementary information with regard to the differing inventory data in the table:

December 1981: According to the State Central Administration for Statistics in reference to the fulfillment of the 1981 national economic plan, by the end of 1981 a total of 13,000 robots had been installed (compare ND of 16-17 January 1982, p 2).

Table 2 (continued)

According to data in the statistical yearbook of the GDR, 1984, p 106, on the other hand at the same date there were altogether 13,680 robots in use.

June 1982: According to P. Verner at the 4th Congress of the Central Committee of the SED in June 1984 there were (literally: "are now") a total of 15,000 robots installed in the entire national economy.

According to information by the State Central Administration for Statistics with regard to plan fulfillment in the first half of 1982 there were on the other hand "already" 16,500 robots in use (ND of 16 July 1982, pp 3-4).

December 1982: According to PRESSE INFORMATIONEN, No 88, 31 July 1984, p 5, in 1982 a total of 22,400 were installed.

On the other hand it is stated in the communication by the State Central Administration for Statistics regarding plan fulfillment in 1982 that "at present" 21,900 robots were in use (ND of 15-16 January 1983, p 3).

Table heading a = narrow definition of the term "industrial robot"

b = broad definition, currently accepted in the GDR, of the term "industrial robot"

In consequence of the increasing use of microcomputers in manufacturing, in the GDR both automated equipment construction and machine tool manufacturing using so-called flexible manufacturing systems are acquiring more and more importance. This trend was particularly observable at the Leipzig 1984 Spring Fair. Here a number new or improved automation designs were shown.⁵³ These included amongst others:

i. the "AUTEVO-ROTA 1," a form of CAD/CAM engineering for "design, technology and manufacturing" as a joint development and joint production of the Berlin VEB "7th October" Machine Tool Combine with the Research Center for Machine Tool Construction in the Karl Marx City VEB "Fritz Heckert" Machine Tool Combine and also with the Dresden VEB Robotron Combine. Also included was

ii. a gear rolling-grinding machine "ZSTZ OG-PC" for cylindrical cutting of gear teeth with microprocessor control; this was produced by the Berlin "7th October" Machine Tool Combine (parent factory).

New developments and improved developments involving a high fraction of micro-electronic control components or memory-oriented controls were also displayed, for example, by the Leipzig VEB "Werner Lambertz" Polygraph Combine.

1. Drafting board-oriented design workplace ROK A 5510,
Built on the basis of the A 5120/A 5130 Robotron office computer (K 1520 microcomputer system), engineered for use at a digitalized workplace
2. Technological workplace TAPL,
Employing the basic computer system A 6402 (microcomputer K 1630), capable of linking with an ESER computer model EC 1040, EC 1055 or EC 1055 M, usable for the rationalization of technological processes such as, e.g., computer-supported work sequence and process organization
3. Printed circuit design workplace AKT A 6452,
Employing the basic computer system A 6402 (microcomputer K 1630), especially applicable in the design of printed circuits
4. Workplace for design and technology AKT A 6454,
Interactive CAD/CAM system, built modularly on the basis of the Robotron microcomputer K 1630, usable, inter alia, for computer-supported graphics, projecting, computation of individual parts, programming of NC machines, etc.
5. Data acquisition and information system DIS A 6422,
Terminal-oriented basic computer system using a system computer (Robotron microcomputer K 1630), to which a maximum of four subsystems can be coupled through a multiplexer; usable for factory and production data acquisition and data processing

Exposition of the first CAD/CAM workplaces: partly at the 1984 Leipzig Spring Fair

Mass production: As of 1984/1985

CAD--Computer-Aided Design

CAM--Computer-Aided Manufacturing

Fig. 11. CAD/CAM workplaces from the Dresden Robotron Combine.

In accordance with plans of the industry ministries the manufacturing processes in the VEB [people's factories] are to be restructured by the end of the eighties on the basis of the automation systems which have been mentioned. But, as in the case of industrial robots, the party leadership and economic leadership of the GDR will also be compelled on occasion to deal with new problems whenever it is impossible to include in the rationalization plan those production steps which precede and follow the new automated phase. As repeatedly shown by instances occurring in manufacturing practice, a manufacturing system possessing increasing flexibility not only becomes more complicated in its manipulation but it also has greater effects upon preceding and following production phases or production lines. In a flexible manufacturing system one is dealing with a very complex configuration. Its smallest unit may be seen in the NC or CNC machine⁵⁴ which in conjunction with other machines forms a so-called manufacturing cell. The integration of several such cells yields a flexible manufacturing system (compare also Figure 13).

Developer	Dresden VEB "Otto Schoen" Robotron Measuring Electronics and Dresden VEB Robotron Center for Research and Technology
Manufacturer	Dresden VEB Robotron Electronics
Exhibition	Leipzig Spring Fair 1984
1984 extent of production	500 pieces
Function groups	Computer boards, keyboard and power supply
Additional modules	12-kbyte ROM Additional module for plug designs for ROM 16-kbyte RAM expansion module Music output module Color extension module
Computer boards	Microprocessor U 880 D with memory as well as input and output interfaces
Performance parameters	8-bit microprocessor in n-channel MOS technology Fixed-value memory with 4 kbyte Write-read memory with 16 kbyte
Keyboard	64 alphanumeric keys (keyboard detached from basic device)
Language	BASIC, U 880-Assembler
Monitor display	Commercially available television monitor (color or black/white)

Fig. 12. The Z 9001 home computer.

Manufacturer	Soemmerda VEB Robotron Office Machine Works
Exhibited	1984 Leipzig Spring Fair and Hannover Fair
Production	As of fall 1984
Function groups	Computer units, monitor, keyboard, output printer (daisy wheel or dot matrix)
Central processing unit	Microprocessor U 880 D
Performance parameters	8-bit microprocessor in n-channel MOS technology, 2.5 MHz Up to 64-kbyte RAM, internally extendable ROM/PROM capacity with 2-kbyte buffer Monitor screen 64 x 16 (characters x lines) extendable to 80 x 24 Serial interface for connecting a printer and a floppy-disk storage
Language	Inter alia, BASIC and PASCAL

Fig. 13. The Robotron 1715 personal computer.

Abbreviations (Figures 12-13):

BASIC	Beginners' All-Purpose Symbolic Instruction Code, dialogue-capable problem-oriented programming language for participant systems
MOS	Metal Oxide Semiconductor, unipolar transistor with laminas in the order metal--oxide--silicon
PROM	Programmable Read-Only Memory, programmable fixed-value memory
RAM	Random Access Memory, direct access memory, memory with optional access
ROM	Read-Only Memory, fixed-value memory

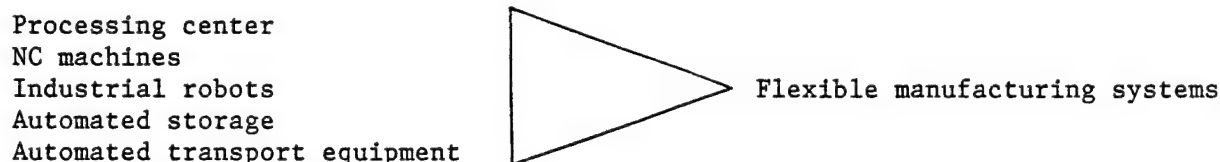


Fig. 14. The general structure of flexible manufacturing systems.

4. Features of the Development of GDR Electronics Hitherto

4.1. Positive Evaluation of Developments up to Now--Linked, However, With Some Criticism of the Situation Created by Scientific-Technical Progress

On the basis of achievements up to that point in the "electrotechnology/electronics" area of industry, as early as the spring of 1984 the GDR minister for science and technology, Herbert Weiz, could assert that "today a third of our machines and facilities are no more than 5 years old" and that the level of automation of productive equipment had risen from 33 percent in 1970 to a total of 51 percent by the beginning of 1984.⁵⁵ In the same way he emphasized the importance of the "elevated level of science and technology and the improved economic value of scientific technical results" as a contribution to rising national income in the GDR.⁵⁶ The first vice president of the Academy of Sciences of the GDR, Professor Hofmann, expressed himself in similarly positive terms, particularly with regard to the work of the academy. As Hofmann reported, inter alia, here had been at the Academy of Sciences "since 1978 a notable rise in inventive activity" which manifested itself, for example, in 1983 in "a high yield of patents."⁵⁷ Consistently with the requirements of our economic strategy for the eighties academy research, according to Hofmann, concentrated especially upon the development and application of microelectronics. Already for the year 1983 the State Central Administration for Statistics has announced an increase in industrial net production as an expression of increased intensification and rationalization of labor and the same agency has also attested the good achievements of science and technology.⁵⁹ One may expect that there will be an equally positive evaluation of developments in the year 1984.

Despite such statements nevertheless the development of science and technology in 1984 continued to be, as in preceding years, the target of criticism,⁶⁰ since the initiated measures aiming at the intensification of innovations and

the increased application of new technologies in industrial practice had not in all cases led to the successes hoped for and warnings of the party leadership and economic leadership had gone unheeded. The criticism referred to specific and in part already familiar facts and it was accompanied by recommendations of ways of overcoming obstacles. In detail it dealt with the following complexes:

- (1) the need to create scientific-technical strategies on an overall economic scale for surmounting obstacles;⁶¹
- (2) the achievement of scientific-technical progress on combine scale through strategies oriented in factory economic terms;⁶²
- (3) the performance of risky research tasks on the basis of the achievement principle and of material incentives;⁶³
- (4) solution of the transfer problem;⁶⁴
- (5) the creation of necessary production capacities for modern developments;⁶⁵
- (6) the surmounting of the differing and in part antiquated production engineering level existing in the combines;⁶⁶
- (7) the surmounting of planning uncertainties arising from science and technology;⁶⁷ and
- (8) the growing importance of the time factor in value creation and the measures [appropriate to?] the problems requiring solution in the given context.⁶⁸

4.2. Increased Cooperation With the USSR

Every form of cooperation on the part of the GDR with the other CEMA countries takes place on the basis of the "complex program for the further deepening and perfecting of cooperation and development of socialist economic integration" which was embarked upon in July 1971 at the 25th consultative congress.⁶⁹ One section of this program regulates the further development of scientific-technical cooperation.⁷⁰

Particularly with the USSR cooperation has been increasingly intensified in this sector. Thus in the "Law Governing the Five-Year Plan for the Development of the National Economy of the GDR in 1981-1985, Dated 3 December 1981,"⁷¹ emphasis was given to "systematic strengthening of socialist economic integration with the USSR" as a "decisive prerequisite for further stable economic development in the GDR." Thus the aim is to promote "further intensification of cooperation in science and technology with the goal of accelerating scientific-technical progress and its effectiveness."⁷² Microelectronics undoubtedly occupies a central position in this cooperation. Although in this sector an agreement was reached as far back as 1977 regarding cooperation between the two countries, this agreement has gained in importance because in the interim the GDR has developed within the CEMA into a significant producer of micro-electronic products. Thus it has now, for example, become capable of manufacturing not only integrated circuits and microcomputers for export to the USSR

but it has also acquired the ability to bring know-how into joint research and development projects. On the basis of previous developments in cooperation, in October 1984 there was agreement on the part of the two countries regarding "a long-term program to develop cooperation" between the two countries "in the area of science, technology and production during the period up to the year 2000."⁷³ The purpose of the program is primarily the achievement of greater cooperation⁷⁴

- i. in the production of microelectronic products, including, for example, electronic components,
- ii. "in the application of microelectronics in computer data processing and information technology; in the technology of measurement, control and regulation in factories and also in communication distribution and communication transmission" and
- iii. in the development, production and distribution of those products on a worldwide level which "guarantee complex mechanization and automation of the primary and secondary processes of production."

In his report to the 9th Congress of the Central Committee of the SED this program was described by Honecker as a historic step "which will have the effect of linking the national economies of our countries still more closely together."⁷⁵ There are several important reasons for this increasingly close cooperation:

- (1) it arises in the first place from the fact that the GDR is a member of the CEMA and from the decision of member states to link their national economies;
- (2) it arises moreover from the strained relations between West and East;
- (3) a further reason may be found in the position which the GDR has by now achieved as a reliable business partner within the CEMA and, in particular, relative to the USSR;
- (4) also the GDR is in a position by itself to supply efficient technologies and electronic products to the USSR which the latter requires to meet its own domestic needs;
- (5) for the GDR a closer bond with the USSR has also become more necessary than in the past because not only the rising cost of research, development and production in the area of microelectronics but also the ever rising speed of innovation and shortening cycle times of innovation compel cooperation with a strong partner within the CEMA.

4.3. Heavily Export-Oriented EDP Production

Undoubtedly it may be assumed that the actual demand for efficient products in electronic computing technology cannot be met in the GDR. Thus toward the end of 1982 as demonstrated by the economist Koziolk "there were more than 300 EDP installations of the ESER series ..." in use.⁷⁶ He spoke of this as a

"significant potential." By far the greatest number of these computers such as, for example, the EC 1040 from the GDR, must be assigned to the model series No 1 or development series No 1 of the ESER⁷⁷ which was already being produced in the years between 1972 and 1978 and even in terms of GDR conditions can be looked upon as already technologically obsolete. Along with the computers of model series 1 one must also count those of model series 2 as well as other computers not belonging to the ESER group and coming from the USSR as well as Western importing agencies. Thus for the end of 1984 this would imply an inventory of about 500 installed universal computers, as an actual figure.⁷⁸ Despite the relatively small inventory of universal computers it is a characteristic feature of the EDP industry in the GDR, particularly for universal computer production, that by far the greatest portion of the produced installations have been exported to other countries, particularly to the USSR (compare Figure 15 for more details). This means that the GDR was not able to participate sufficiently in the scientific-technical progress which it had attained because the supply obligations to the USSR enjoy absolute priority.⁷⁹ The agreements entered into for the year 1984 between the USSR (Elektronorgtechnika Foreign Trade Agency) and the GDR (Robotron Export-Import) provide for mutual supplies of ESER computers to an amount totaling 268 million rubles. According to this the USSR was required to deliver 12 ESER computers of type EC 1035 to the GDR and the GDR on the other hand was required to deliver 76 computers of the type EC 1055 M to the USSR.⁸⁰ The final 400th computer of type EC 1055 was exported by Robotron in November 1984 to the USSR for "automation of processes of finance." Between the years 1981 and 1984 the value of products exported to the USSR in the area of electronic computer technology was, according to Mittag 850 million valuta marks.⁸¹

But for some time now there have also been intensified export activities toward the West.⁸² The GDR products which, for example, are being offered in the Federal Republic of Germany by various West German firms include, in particular:

- i. the new Robotron printers (dot matrix printers) K 6311 and K 6312 which have been sold with good success by the UNITRONIC Company (Duesseldorf/Hamburg) under the name "EUROPRINT" and which have earned relatively good test results in the electronics journal CHIP;⁸³
- ii. Robotron printing equipment which constitutes the most essential constituent of the daisy wheel "Handytype" printer;
- iii. electronic typewriters by Robotron which are offered, for example, under the trade name "Rototype";
- iv. the chess computer SC 2 exhibited for the first time at the 1981 spring fair and produced by the Erfurt Microelectronics Combine;⁸⁴
- v. recently also microcomputers presumably the Robotron personal computer PC 1715 (compare also Figure 13) as well as finally
- vi. software by Robotron ranging from factory accounting software to software for computer-controlled cancer irradiation.

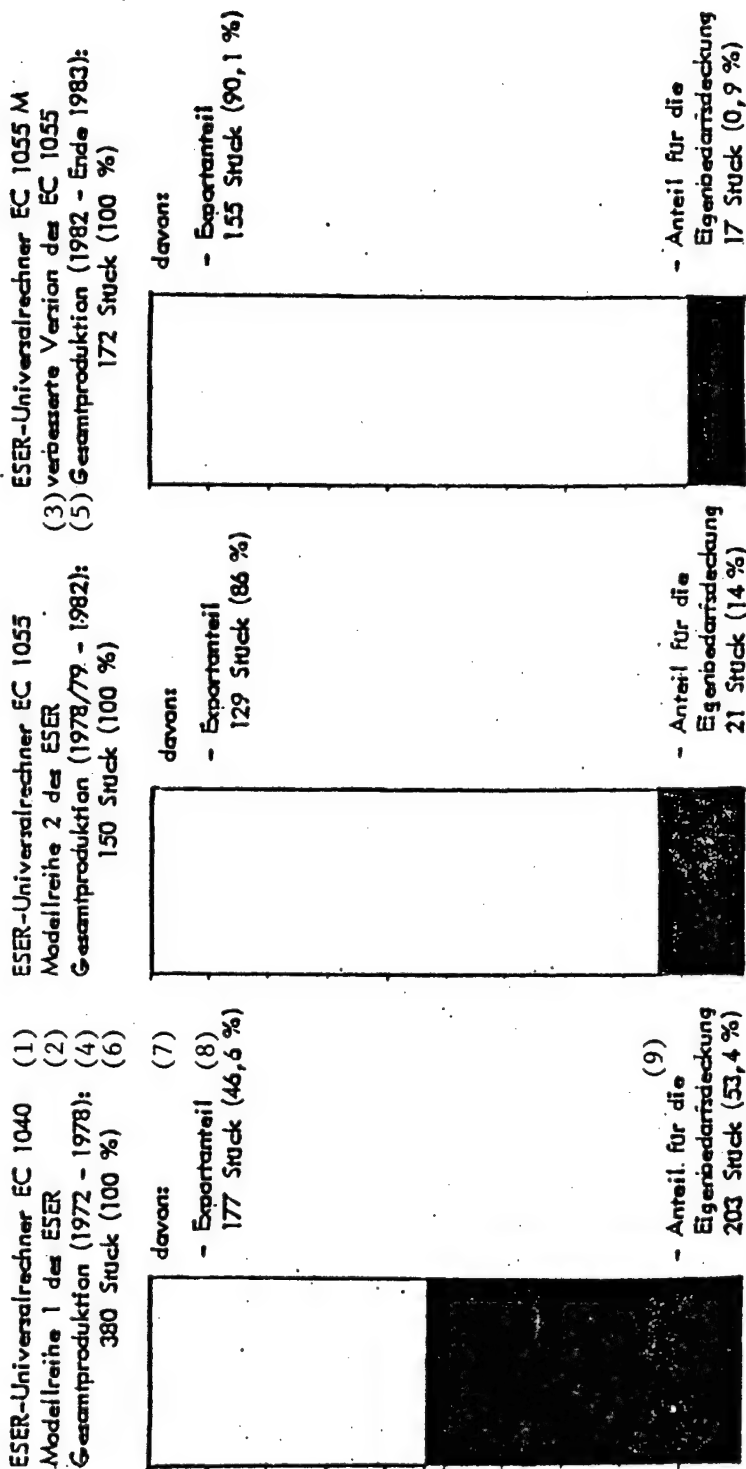


Fig. 15. Increasing universal computer exports to the USSR despite unsatisfactory coverage of our domestic demand.

- Key:
1. ESER universal computer ...
 2. Model series ... of the ...
 3. Improved version of the ...
 4. Total production ...
 5. Total production (... end ...)
 6. ... pieces ...
 7. Of which:
 8. Export fraction
 9. Fraction to cover domestic demand

Calculated according to data given in the journal RECHENTECHNIK/DATENVERARBEITUNG, No 8, 1984, p 6.

ESER, abbreviation for uniform system of electronic computer technology.

For a long time now Robotron typewriters have been sold in the Federal Republic primarily through department stores and mail order. As reported in this connection at the 1984 Hanover Fair almost 100 percent of West German demand for mechanical typewriters is being met by deliveries from the GDR.

4.4. Promotion of the Production of Products Having "Productive Character"

The foreground of state support is occupied primarily by those products and technologies which as "intensification factors" promise successful rationalization in industrial production processes and thus promise increasing productivity.

Microelectronics in the GDR have for some time been also increasingly affecting so-called "nonproductive" sectors such as, for example, the health area, in which microcomputers are used for the scheduling of irradiation, for the description of X-ray findings and for obstetric surveillance. Microelectronics have also been used in the service sector where microcomputers are employed in postal check offices, savings institutions and banks. Under the pressure of electronic development in the West moreover there has also been activity in the area of personal and home computer production. Nevertheless, it must be assumed that in the GDR production figures for such products will be deliberately kept limited. This is not only because financial resources are lacking for mass production in this latter area but also there is the consideration that such computers are looked upon not as hobby devices but primarily as instruments of education. They should, for example, be used purposefully to help out the education of pupils and students on the road toward their occupational calling and also in the interest of the general public to enlarge the knowledge of those who are already engaged in their occupations and to expand this knowledge in the interest of economic strategy. Hobby computers in this way become not only "intelligence amplifiers" within the context of a new education strategy but also become products possessing "productive character."

4.5. The Increased Importance of Information Processing

Under the influence of microelectronics, information processing, information technology and communications technology have also developed in the GDR into key industries⁸⁵ and thus are considered to be intensification factors. In response to international developments and the growing importance of information processing as well as their further development and effective use in the GDR, in February 1984 the "National Informatik Conference INFO 84" was organized by the Academy of Sciences and other scientific institutions.⁸⁶ The congress lectures were concerned with the international tendencies existing in "informatics," with its current status of development in the GDR and also with questions relating to informatics education. At the same time the subject of the congress was, inter alia, the use of new information technologies for the more effective design of managerial processes.⁸⁷ In the given context special questions and problems were also certainly touched upon which relate to the development and preparation of industrially oriented software within the framework of computer-supported management systems and information systems. Because of the increasingly pronounced influence of information technology and

communication technology upon factory-industrial processes it will have become apparent at this conference that also in the area of research and theory it is necessary to develop a sufficiently complete design for an EDP orientation of existing socialist industry. We speak here of a design which not only deals with fundamental problems but which also demonstrates by means of concrete examples the influence of computer technology and other technologies upon industrial interrelationships.

5. Final Remarks Summarizing the Preceding

In consequence of intensive support measures undertaken by the party leadership and the economic leadership of the GDR there has been a visible upturn here in microelectronics in recent years. Thus the GDR has during these years also developed into an important cooperative partner of the USSR in the scientific-technical area. Despite this upturn the GDR finds itself confronting a multitude of problems which are at odds with the desired further development of science and technology. Here it is a matter first of all of problems which arise in general from the natural constraints to which technological development is subject: those institutions which are active in research, development and production must cope with the ever increasing pace of innovation, the ever shortening cycle times of innovation and the steadily growing cost of research efforts and development efforts.

There is no doubt, too, that the growing level of cooperation with the USSR in the scientific-technical area, which burdens the GDR with increased technology exports to the USSR, calls for some solution to the problems which arise in consequence.

Finally, one finds oneself confronting the problems typical of centrally planned economies. These are problems which arise especially as a result of innovation inertia and they are problems with which we have been striving for many years. Nevertheless, as in past years it is believed that all problems can be resolved by means of new measures so that the economic strategy for the eighties can be realized consistently with planning. In view of the plans laid down for the coming years in the GDR for further development of science and technology and especially in view of the still remaining backlog of needs relative to the further automation of production and the continuing need to meet the demand for computer capacities we may expect that not only the microelectronics industry but also those industries which it influences will in future continue to be important carriers of national economic growth.

FOOTNOTES

1. "Report by the State Central Administration for Statistics Concerning Performance of the National Economic Plan for 1984 in the First Half-Year," in: NEUES DEUTSCHLAND, 14/15 July 1984, pp 3-4.
2. Thus, inter alia, Werner Bertoldi, director of the Institute for Semiconductor Physics, in an interview in "Great Expense for the Smallest Components," SPECTRUM, Berlin (East), No 9, 1984, pp 21-22; also along the same

lines Erich Honecker: "From the Report of the Politburo to the 9th Congress of the Central Committee of the SED," in: NEUES DEUTSCHLAND, 23 November 1984, p 5.

3. Erich Honecker, *ibid.*
4. Erich Honecker, *ibid.*
5. "Law Governing the 1984 National Economic Plan, 8 December 1983," in: LEGAL GAZETTE OF THE GDR, 12 December 1983, Part I, No 33, p 319.
6. *Ibid.*, likewise Kurt Hager: "From the Report of the Politburo to the 8th Congress of the Central Committee of the SED," in: NEUES DEUTSCHLAND, 25 May 1984, p 5.
7. Erich Honecker: "From the Report of the Politburo to the 9th Congress of the Central Committee of the SED," *loc. cit.*, p 5.
8. The same, *ibid.*
9. Compare in particular the remarks by Kurt Erdmann: "Aspects of GDR Reform Activity--Intensification and Experiments," in: "Development Designs for the GDR Economy in the Experimental Phase," Part III, 10th Symposium of the Research Agency on 22-23 November 1984, FS ANALYSEN, No 7, 1984, Appendix 1; also Guenter Lauterbach: "Changes in the Management, Planning and Control of Science and Technology," in: "Development Designs for the GDR Economy in the Experimental Phase," Part II, 10th Symposium of the Research Agency on 22-23 November 1984, FS ANALYSEN, No 6, 1984, pp 51-57.
10. Compare in addition the remarks by Karl C. Thalheim: "Ten Years of Economics and Economic Policy in the GDR," in: "Development Designs for the GDR Economy in the Experimental Phase," Part I, 10th Symposium of the Research Agency, FS ANALYSEN, No 5, 1984, pp 34-37.
11. Erich Honecker: "From the Report of the Politburo to the 9th Congress of the Central Committee of the SED," *loc. cit.*, p 5.
12. The same, *ibid.*
13. Compare, *inter alia*, Rudi Wekker, deputy to the minister for electrical engineering and electronics: "Effective Rationalization Devices Through Microelectronics," in: PRESSE INFORMATIONEN, No 108, 14 September 1984, p 2.
14. With regard to the state contracts compare, *inter alia*, the "Resolution Regarding the 'Ordinance Covering Work Under State Contracts in Science and Technology' of 18 February 1982--Excerpt," in: LEGAL GAZETTE OF THE GDR, 17 March 1982, Part I, No 9, pp 181-183; and "What Are State Contracts?" in: PRESSE INFORMATIONEN, No 106, 11 September 1984, p 4.

15. Compare in detail the already cited legal regulations in: "Resolution Governing the 'Ordinance Affecting Work With State Contracts in Science and Technology ...'" and also the appendix to this resolution: "Ordinance Affecting Work With State Contracts in Science and Technology."
16. Compare "Ordinance Regarding Guidelines for Planning in Combines and Factories of Industry and Also Guidelines in the Construction Area, Dated 30 November 1979," in: LEGAL GAZETTE OF THE GDR, 22 February 1980, special publication No 1021, pp 85-106.
17. Compare in addition the remarks under the heading "Specification Volume," in: "Woerterbuch der Oekonomie Sozialismus, 5. Ueberarbeitete und ergaenzte Auflage" [Dictionary of the Economy of Socialism, Fifth Revised and Enlarged Edition], Dietz Verlag, Berlin (East), 1983, pp 676 and 677; "Ordinance Regarding the Specifications Volume for the Development and Further Development of Products, Processes and Technology--Specifications Ordinance of 27 April 1977," in: LEGAL GAZETTE OF THE GDR, 13 May 1977, Part I, No 14, pp 145-148; and also the "Ordinance Governing the Specifications for Tasks in Research and Development--Specifications Ordinance of 17 December 1981," in: LEGAL GAZETTE OF THE GDR, 14 January 1982, Part I, No 1, pp 1-5.
18. On combine reform compare, inter alia, Kurt Erdmann and Manfred Melzer: "The New Combine Ordinance in the GDR. Possibilities and Limitations Characterizing Performance Impulses in the Newly Established Combines (First Part)," in: DEUTSCHLAND ARCHIV, Cologne, No 9, 1980, pp 929-942; the same, "Second Part," in: DEUTSCHLAND ARCHIV, Cologne, No 10, 1980, pp 1046-1062; also Klaus Krakat: "Organization Practice in the GDR. Examples for Economic and Managerial Organization," FS ANALYSEN, No 3, 1980, pp 9-59.
19. Compare Klaus Krakat: "The Recent Status of Microelectronics," in: "Economic Growth in Theory and Practice of the GDR System," 7th Symposium of the Research Agency, review dated 20 November 1981, FS ANALYSEN, No 9, 1981, pp 85-90.
20. "The Reconfiguration of Plants in the VEB Robotron Combine," in: RECHEN-TECHNIK/DATENVERARBEITUNG, Berlin (East), No 10, 1984, p 2.
21. "On 1 May With Fulfilled and Overfulfilled Plans. Fighting Goals in Competition Toward Strengthening the Republic," in: NEUES DEUTSCHLAND, 17 April 1984, p 1.
22. Guenter Mittag: "Theoretical Generalization of Experience Obtained in the Development of Combines for Increased Efficiency in the National Economy, With Special Reference to the Use of Qualitative Growth Factors," in: WIRTSCHAFTSWISSENSCHAFT, Berlin (East), No 1, 1984, p 22.
23. Compare Klaus Krakat: "Organization Practice in the GDR. Examples for Economic and Managerial Organization," loc. cit., p 25.

24. Compare, inter alia: "On 1 May With Fulfilled and Overfulfilled Plans. Fighting Goals in Competition Toward Strengthening the Republic," in: NEUES DEUTSCHLAND, 14 April 1984, p 1; also Heinz Wedler, general director of the Erfurt Microelectronics Combine: "35 Years of the GDR--A Successful Course Toward the Prosperity of the People. Men, Microelectronics and the Advantages of Our Planned Economy," interview in NEUES DEUTSCHLAND, 16 March 1984, p 3.
25. "Berlin Plant Builders Have Set the Standard for Party Congress Competition," in: NEUES DEUTSCHLAND, 28 November 1984, p 1; also "High Performance for the Prosperity of the People and for Peace--Forward Toward the 11th Party Congress of the SED. Overfulfillment of 1985 Plans--Our Contribution to the General Strengthening of the GDR," *ibid.*, p 3.
26. "MMM" is the abbreviation of "Messe der Meister von Morgen" [Fair for the Masters of Tomorrow]. This is a state-sponsored "mass movement" of youth in the GDR which aims to support the further development of scientific-technical progress. The "central fair of the masters of tomorrow" takes place in the late fall of each year in Leipzig. In 1984 the 26th fair of this type took place there.
27. Compare, inter alia, "Impressive Accounting Record of Young Innovators in the Peace Effort of the FDJ. 26th Central Fair of the Masters of Tomorrow in Leipzig," in: ZEITSCHRIFT LEBENSMITTELINDUSTRIE, Berlin (East), No 1, 1984, pp 8-11; also Lothar Monsees: "Impressions in Leipzig," in: SPECTRUM, Berlin (East), No 1, 1984, p 19.
28. Compare in addition Helmut G. Schneider: "Experiences Acquired in Continued Education in the Area of Microelectronics," in: DAS HOCHSCHULWESEN, Berlin (East), No 5, 1984, p 122.
29. Compare in addition Heinz Lorenz: "Switching Circuits Replace Picture Tubes. Facultative Electronics Course Conducted as of September 1984 According to a New Program," in: NEUES DEUTSCHLAND, 3-4 March 1984, p 11; also the same: "Facultative Electronics Courses in Classes 9 and 10 According to a New Program," in: PRESSE INFORMATIONEN, No 17, 9 February 1984, p 6.
30. Heinz Wedler, "35 Years of the GDR--Successful Course Toward the Prosperity of the People. Men, Microelectronics and the Advantages of Our Planned Economy," interview, *loc. cit.*, p 3.
31. Heinz Wedler, *loc. cit.*, p 3.
32. *Ibid.*
33. Compare, inter alia, "Leipzig Spring Fair 1984, Part I," here: "Components," in: RADIO-FERNSEHEN-ELEKTRONIK, Berlin (East), No 6, 1984, pp 344-347; also Klaus Krakat: "GDR Microelectronics at the Leipzig Fair Well Represented. Electronics Combine Show User-Designed Engineering," in: COMPUTERWOCHE, Munich, No 15, 6 April 1984, p 44.

34. Thus a reference to the Leipzig 1984 Fall Fair and the news brief "New in the Trade," in: RADIO-FERNSEHEN-ELEKTRONIK, Berlin (East), No 11, 1984, p 683.
35. Compare in addition Klaus Krakat: "The Recent Status of Microelectronics," in: "Economic Growth in Theory and Practice of the GDR System," 7th Symposium of the Research Agency, review dated 20 November 1981, FS ANALYSEN, No 9, 1981, pp 99-102.
36. Compare Heinz Wedler, loc. cit., p 3.
37. With regard to the microcomputers compare also, inter alia, Klaus Krakat: "The Achievement of Scientific-Technical Progress as Illustrated in Microelectronics," 5th Symposium of the Research Agency, review dated 22 November 1979, FS ANALYSEN, No 1, 1980, here in particular pp 57-71; as well as the same: "The Production and Application of Microprocessors in the GDR," FS ANALYSEN, No 7, 1981, pp 88-91.
38. OEM, abbreviation for Original Equipment Manufacturer, devices which were constructed in other production systems.
39. CAD, abbreviation for computer-aided design; CAM, abbreviation for computer-aided manufacturing (compare also Figure 11).
40. Compare, inter alia: "The Computer Reserves Your Seat in the City Express. Microelectronics Is Having an Essential Influence in Rationalizing Transport/About 940 Robots Have Been in Use Thus Far," in: NEUES DEUTSCHLAND, 10 April 1984, p 3.
41. Compare in addition the corresponding Robotron news briefs at the recent Leipzig spring fairs.
42. Compare also "Electronic Computing Technology, Use in the Area of Health in the German Democratic Republic," VEB Robotron Center for Research and Technology, Dresden, 1981.
43. In the West the first personal computer was on the market as early as 1975. This was the IBM 5100 which at that time was still being sold as a so-called "workplace computer."
44. "The Instrument Electronics Engineers Produce the First Home Computer in 1984," in: SAECHSISCHE ZEITUNG, 12 January 1984.
45. Christoph Weber, Wolfgang Lampenscherf, Karl-Heinz Homilius: "The Model EC 1056," in: RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 8, 1984, p 5.
46. With regard to the achieved improvements and the individual performance parameters compare Christoph Weber, Wolfgang Lampenscherf, Karl-Heinz Homilius, ibid., pp 5-7; also Rainer Marschner: "Service Processor EC 7069.M," in: RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 8, 1984, pp 8-12.

47. Christoph Weber, Wolfgang Lampenscherf, Karl-Heinz Homilius, loc. cit., p 6.
48. "Use of Industrial Robot Technology for High-Performance Growth and Further Improvement in Working Conditions," in: PRESSE INFORMATIONEN, Berlin (East), No 88, 31 July 1984, p 5.
49. "Robots, Progress in Efficiency and Our Policy--The Main Task," in: NEUES DEUTSCHLAND, 31 October 1984, p 3.
50. Compare, inter alia, also the remarks by Irene Fischer: "Modernization of the Physical Plant," in: EINHEIT, Berlin (East), No 3, 1984, pp 213 and 214.
51. Compare: "Another 11,700 Robots Are Being Used in 1984," in: NEUES DEUTSCHLAND, 18-19 February 1984, p 3.
52. So also Anneliese Braun: "What Makes Industrial Robots Effective," in: SPECTRUM, Berlin (East), No 4, 1984, p 7 (here Note 1).
53. Compare, inter alia, the papers "WMW: Peak Performance for Rational Manufacturing" and "Processing Centers. Manufacturing Cells. Flexible Manufacturing Systems," in: DIE WIRTSCHAFT, edition for the Leipzig Spring Fair 1984 (March 1984), pp 69-73.
54. NC, abbreviation for Numerical Control; CNC, abbreviation for Computer Numerical Control.
55. Herbert Weiz: "Science and Technology for the Present and the Future of Our Country," in: EINHEIT, Berlin (East), No 3, 1984, p 199. Compare also Erich Honecker: "From the Report of the Politburo to the 9th Congress of the Central Committee of the SED," in: NEUES DEUTSCHLAND, 23 November 1984, p 4.
56. Herbert Weiz, loc. cit., p 200.
57. Ulrich Hofmann: "Inventive Activity Oriented Toward Research," in: PRESSE INFORMATIONEN, Berlin (East), No 30, 9 March 1984, p 2.
58. Ulrich Hofmann, ibid.
59. Compare in detail the data in the "Report of the State Central Administration for Statistics Concerning Performance of the National Economic Plan for 1983," in: NEUES DEUTSCHLAND, 19 January 1984, pp 3 and 4.
60. With regard to criticism by the party leadership and economic leadership of the GDR concerning the status of scientific-technological progress in previous years compare, inter alia, Klaus Krakat: "New Communications Technologies in the GDR," in: "Economics and Economic Policy Subject to Uncertainties and Risks, Part III," 9th Symposium of the Research Agency, review dated 18 November 1983, FS ANALYSEN, No 7, 1983, pp 104-109.

61. Compare Harry Mayer, "Scientific Technological Strategy Configuration and Growth in Efficiency," in: WIRTSCHAFTSWISSENSCHAFT, Berlin (East), No 2, 1984, pp 196-201; the same: "Interdisciplinary Work in Establishing Scientific-Technical Strategies," in: EINHEIT, Berlin (East), No 5, 1984, pp 420-424; also the same: "Configuration of Strategies Under Conditions of the Scientific-Technical Revolution--Problems in Enhancing the Contribution of Fundamental Research to the Innovative Power of the National Economy," in: WIRTSCHAFTSWISSENSCHAFT, Berlin (East), No 11, 1984, pp 1614-1629.
62. Compare Claudia Grafe/Dieter Liebing/Harry Nick/Heinz Willems: "On the Management of Scientific-Technical Progress in the Combines," in: EINHEIT, Berlin (East), No 5, 1984, pp 410-415.
63. Compare, inter alia, Herbert Weiz, loc. cit., pp 205 and 206; Claudia Grafe/Dieter Liebing/Harry Nick/Heinz Willems, loc. cit., pp 413 and 414; also Rudolf Streich and Guenter Gruetzner: "Effectively Stimulating Peak Performance in Science and Technology," in: ARBEIT UND ARBEITSRECHT, Berlin (East), No 10, 1984, pp 229-231.
64. Compare, inter alia, Harry Mayer: "Scientific-Technical Strategy Configuration and Growth in Efficiency," loc. cit., pp 200 and 201; also the challenge in "Law Governing the 1984 National Economic Plan, 8 December 1983," in: LEGAL GAZETTE OF THE GDR, 12 December 1983, Part I, No 33, p 319.
65. On the problem of scarce resources for innovations compare Heinz-Dieter Haustein: "The Time Factor and Efficiency in the Phase of Production Preparation," in: WIRTSCHAFTSWISSENSCHAFT, Berlin (East), No 2, 1984, here in particular pp 205 and 206.
66. Compare, inter alia, also Heinz-Dieter Haustein, loc. cit., p 206.
67. With regard to the contradictions between the originally established plan goals and plan tasks and the objective constraints arising from science and technology compare Wilfried Ballaschk: "Dynamics, Stability and Law," in: STAAT UND RECHT, Berlin (East), No 11, 1984, p 922; also in addition to this the remarks by Otto Reinhold: "Intensively Expanded Production--A Revolutionary Process," in: EINHEIT, Berlin (East), No 8, 1983, p 723.
68. Compare in detail Heinz-Dieter Haustein: "The Time Factor and Efficiency in the Phase of Production Preparation," pp 202-207; Erhard Beier: "Making Inventions Quickly Effective in Production," in: PRESSE INFORMATIONEN, No 105, 8 September 1983, p 2; also Klaus Steinitz/Heinz Schilar: "Some Problems of Value-Setting and Value Realization in Connection With the Development and Application of Microelectronics," in: WIRTSCHAFTSWISSENSCHAFT, Berlin (East), No 10, 1983, pp 1503-1520.
69. Compare the further discussion in: "CEMA Documents. On the Strengthening and Perfecting of Cooperation and the Development of Socialist Economic Integration," Berlin (East), 1971.

70. Ibid., Section 5, pp 40-47.
71. LEGAL GAZETTE OF THE GDR, 9 December 1981, Part I, No 35, pp 405-418.
72. Ibid., p 415.
73. Compare "Program of Cooperation Until the Year 2000 Between the GDR and the USSR in Science, Technology and Production," in: NEUES DEUTSCHLAND, 8 October 1984, p 9.
74. Compare in detail the "Program," p 9.
75. Erich Honecker: "From the Report of the Politburo to the 9th Congress of the Central Committee of the SED," loc. cit., p 5; on economic and scientific-technical cooperation with the USSR compare in addition the remarks of Guenter Mittag: "Economic and Scientific-Technical Cooperation With the Land of Red October," in: EINHEIT, Berlin (East), [illegible].
76. Helmut Koziolk: "Thoughts on Further Applications of Data Processing in the GDR," in: RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 1, 1983, p 5; on the development of the inventory of computer facilities installed in the GDR compare, inter alia, Klaus Krakat: "On Text Processing in the GDR," FS ANALYSEN, No 1, 1983, p 11.
77. ESER is the abbreviation for: Uniform System of Electronic Computer Technology.
78. On the development of the inventory of the research facilities installed in the GDR as of 1961 compare, inter alia, Klaus Krakat: "On Text Processing in the GDR," FS ANALYSEN, No 1, 1983, pp 10 and 11.
79. With regard to computer facilities exported to other CEMA countries and in particular to the USSR compare, inter alia, Klaus Krakat: "On Text Processing in the GDR," loc. cit., pp 13-15.
80. Compare "Mutual Deliveries GDR-USSR," in: RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 4, 1984, p 2.
81. Guenter Mittag: "Economic and Scientific-Technical Cooperation With the Land of Red October," loc. cit., p 976.
82. Compare, inter alia, Michael Gatermann: "GDR Computers. Software for Hard Cash," in MANAGER MAGAZIN, Hamburg, No 12, 1982, pp 66 and 67.
83. Compare TECHNISCHE INFORMATION, No 4, 1984, of the UNITRONIK Company, and also "Chip Test: The Matrix Printer Europrint," in: CHIP, Munich, No 4, 1984, pp 102 and 103.
84. In the meantime a new and more effective chess computer was exhibited at the Leipzig 1984 Spring Fair: the CM (Chess Master), also from the Erfurt Microelectronics Combine.

85. Compare, inter alia, Klaus Krakat: "New Communications Technologies in the GDR," in: "Economics and Economic Policy Subject to Uncertainties and Risks, Part III," 9th Symposium of the Research Agency, review dated 18 November 1983, FS ANALYSEN, No 7, 1983, pp 71-110.
86. Compare in detail the deputy to the minister for science and technology, Guenter Zillmann: "Computer Technology as an Intensification Factor," in: RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 6, 1984, p 1; and also publications regarding "INFO 84" in the same issue, pp 5-28.
87. Compare Gerd Friedrich, "Modern Information Technology and the Management Process," in RECHENTECHNIK/DATENVERARBEITUNG, Berlin (East), No 6, 1984, pp 9-11.

Research Agency Analyses 1984--11th Year

Issue 1	Karl C. Thalheim Kurt Erdmann Maria Haendcke-Hoppe Wilhelm Homann Klaus Krakat	Present Reform Efforts in the Economic System of the GDR--Renaissance of the "New Economic System"?
Issue 2	Maria Haendcke-Hoppe	Latest Developments in Private and Trade Union Handwork in the GDR and in Other Areas of the Private Economy
Issue 3	Karl Hohmann	Development and Importance of Private Agrarian Production in the GDR
Issue 4	Kurt Erdmann	On Revaluation of Primary Capitalization in the GDR
Issue 5	10th Symposium of the Research Agency on 22-23 November 1984	Development Concepts for the GDR Economy in the Experimental Phase, Part I
	Ludwig Rehlinger	A Word of Welcome
	Alfred Schueller	Ten Years of Symposia by the Research Agency for Inner German Economic and Social Questions
	Karl C. Thalheim	Ten Years of Economics and Economic Policy in the GDR
	Maria Haendcke-Hoppe	Ten Years of Foreign Economics and Foreign Economic Policy in the GDR

Responsible editor: Prof Dr Karl C. Thalheim
Reproduction only with the consent of the Research Agency
Quotations only when accompanied by source; copies are requested
Research Agency, Stresemannstrasse 90, 1000 Berlin 61
Telephone: 030/261 13 17

8008
CSO: 2302/84

GERMAN DEMOCRATIC REPUBLIC

PRODUCTION PLANNING MANAGER ON CAD-CAM USE

East Berlin NEUES DEUTSCHLAND in German 25 Jun 85 p 3

[Article by Dr Reinhard Mattern, Production Planning Department manager, Erfurt "Herbert Warnke" Metal-Forming Combine: "Designers Lay Out Presses by Monitor Screen and Computer"]

[Text] "It is not just by chance that the exploitation of science occupies a front place in our economic strategy. We have much to gain thereby and at the same time we profit thereby in many other areas." These words of Erich Honecker at the 10th Congress of the Central Committee of the SED confirm not only our previous experience in the combine but to a special degree they also bear upon recent ideas emerging in intercombine competition and also bear upon discussion in the factory collectives with regard to the 1986 national economic plan.

This year we have thus far overfulfilled all tasks assigned by the plan. It is a characteristic feature of our development that 90 percent of the growth in performance has arisen from the application of scientific-technical achievements. On this basis it is now our goal by the end of the year to exceed the planned net production by a total of 5 working days' output and thus create good initial conditions for accomplishing the bigger tasks of the 1986 plan. Thus, inter alia, we intend next year to increase labor productivity by 10.7 percent in comparison with this year's plan goals.

We construct principally shaping machines and plastic-forming machines. To an ever increasing degree the production program is characterized by transition from the individual machine to complex automated technological engineering approaches which offer the user enormous production advantages. Anyone who wants to meet the demands of his own industry and wants to be exportable in all markets--in short, anyone who wants to keep abreast of the times--must be better than the competition and must react more quickly and more flexibly to customer desires. An essential prerequisite for this is the use in Erfurt of CAD-CAM systems. CAD-CAM stands for manufacturing which throughout its entire course employs in-house tailored computer programs.

The central advantage of this is the fact that production preparation and the manufacturing process itself take place to a large extent in parallel. The time from contract signature to acceptance of the products by the customers

has, for example, been shortened in the case of some important export contracts from a former interval of 16 to 18 months to a period of 6 to 8 months. The following typical example perhaps makes plain how this has been possible: The manual calculations for producing a variant design for special transmissions--and it is not unusual for several dozen to be produced--took from 10 to 14 days 2 years ago. At the CAD-CAM workbench the designer has the result in front of him on the monitor screen within 40 seconds. I believe I can safely say that only by means of such engineering approaches can one accomplish permanently high rates of innovation and can one achieve a steady transformation of the product line and the production profile with maximum economic effect.

In our combine a thoroughgoing introduction of this technology was an essential prerequisite for achieving an increase in the production innovation level from 11 to 16 percent at the beginning of the eighties to about 30 percent this year and for reacting flexibly to demand at home and in the international marketplaces. Thus today we are capable of within about 3 years replacing the present product line with machines having very much improved performance parameters.

But plan discussion up to now shows that what has been achieved does not represent laurels to be rested upon but is rather a spur to incite us toward continuously keeping up with the highest world standard by means of quality products and at the same time to have a share in determining that world standard. This relates as much to the scientific-technical level of these products as to their economic merit.

Nevertheless, for all the advantages of modern technology it is in the last analysis the people, their training and the level of their performance which determines "how successfully the most up-to-date technology can be transformed into a high-level economy." Those were the words of Erich Honecker at the most recent Central Committee congress. Among us, too, a special role is played by such issues as (1) a broad adaptation of knowledge to mastery of the new technology and (2) the formation of necessary attitudes and motivations. Thus, for example, the creation of required computer programs does not merely call for simple learning of facts by rote but also calls for entry into absolutely new unexplored territory and the changing of many traditional habits of work and thought. In a word we must direct our attention repeatedly to larger interrelationships, we must strengthen our confidence in our own powers and we must reinforce readiness to take risks and consciousness of responsibility on the part of engineers and technicians. In this I perceive for myself as a manager in close cooperation with the party organization fundamental tasks whose accomplishment demands at least as much effort as that which is demanded on a technical level by the introduction of the Erfurt CAD-CAM system.

(Dr Mattern (age 47) has been working in the plant for 26 years. A machinist, he studied economics at the Friedrich Schiller University in Jena and graduated in 1979 with a degree in information processing.)

8008
CSO: 2302/85

GERMAN DEMOCRATIC REPUBLIC

MODERNIZATION STEPS IN AUTOMATION EQUIPMENT ENTERPRISE CITED

East Berlin NEUES DEUTSCHLAND in German 25 Jun 85 p 3

[Interview with Werner Wege, director, Mansfeld "Wilhelm Pieck" Automation Equipment Enterprise, by Reinhard Bauerschmidt]

[Text] Werner Wege, age 53, occupation electrician, engineering studies in electrical engineering; worked until 1967 in the Helbro August Bebel Metallurgical Works; since 1967 manager of Mansfeld Automation.

NEUES DEUTSCHLAND: Erich Honecker emphasized at the 10th Central Committee Congress that the modernization of existing physical plant must take place along a broad front. What experience have you had along these lines in the Mansfeld Combine?

Werner Wege: At the first red meeting in the combine for discussion of the 10th congress many of our Mansfeld people affirmed that Erich Honecker's remarks on this important aspect of our economy were in full agreement with what we have encountered in carrying out the economic strategy. They encourage us to continue the purposeful pursuit of the path we have entered upon in the Mansfeld combine toward the quantitative and qualitative strengthening of the means of rationalizing production.

Purposeful and prudent modernization must guarantee that the latest results of scientific-technical progress shall be incorporated into the updating of the material-technical basis of our economy. For us this is assured by a complex program which aims at the technological renovation of the physical plant existing in the mines and mills. This program makes it possible to more rapidly put into application on the economic plane the most current achievements of science so as to transform entire technological processes and achieve a completely new level of quality overall in the modernization of our physical plant. The high value of our key equipment and facilities is a "treasure." Its effectiveness must be steadily enhanced through microelectronics, robot technology and automation technology.

NEUES DEUTSCHLAND: And does the construction of the means of rationalization in the combine play the decisive role there?

Werner Wege: No question. Because through the dynamic growth in the power of our instruments of rationalization we create the decisive prerequisites for accomplishing all economic tasks in the combine, including the task of modernization while simultaneously improving conditions of work and life. That is also a central idea in current discussions of the plan. For 1986 we are striving in the combine--with a 7.8-percent increase in net production--once again to achieve a 19.6-percent higher level of production on a technological basis. It is on this basis that we are able to quickly carry out labor-intensification projects such as the introduction of a new generation of windlasses in the copper mines or the continuous modernization of the wire drawing facilities and casting facilities and rolling facilities in the Hettstedt copper-silver mills. The capacity of the latter will be increased by an additional 10,000 tons. As a result of the general redesign of the briquetting facilities at the August Bebel mills in Helbra the copper losses will be reduced by 2 percent and the fuel consumption by at least 3 percent. There will also be a reduction in environmental stresses.

NEUES DEUTSCHLAND: What tasks confront the automation engineers?

Werner Wege: We are concentrating on application of the key technologies; we are accelerating the use of robot engineering and automation as well as microelectronics. Since 1982 in the combine, for example, more than 300 robots have been integrated into the production process. In the course of this operation, even in our plant--specialized as it is in this area--it has paid off to create efficient work groups for the exploitation of microelectronics and corresponding user programs. We combined the most competent cadres for this purpose. This approach made it possible, for example, within a very short time to produce a programmable control system for the heat treatment furnaces in the Groeditz steel mills. Since then it has passed the test of practical use with flying colors. It is expected that in 1986 all 144 annealing furnaces in the East Steel Mill Combine will be equipped with this control system. The system should achieve considerable energy conservation, improved performance and higher quality.

Altogether we in the automation plant intend in 1986 to increase the construction of tailored technology by about 40 percent--a measure of progress which is in accord with the orientation of the 10th Central Committee Congress.

8008

CSO: 2302/85

GERMAN DEMOCRATIC REPUBLIC

PROGRESS IN ROBOTICS DESIGN, PRODUCTION DESCRIBED

East Berlin NEUES DEUTSCHLAND in German 25 Jun 85 p 3

[Article by Juergen Bauer, laboratory engineer, Berlin Robotics Technical School: "Robots Learn 'Grasping' More Quickly"]

[Excerpts] This week our ZIM 10-1 industrial robot will start to be equipped with a new control system produced by the "Karl Marx" VEB Numerik. As a result the robot will be usable even more flexibly in welding and grinding, operating machine tools and in stacking parts for transport or storage. And it will be able to make an even more effective contribution to the improvement of product quality, to fuller exploitation of machines, saving of work time and at the same time to improvement in working conditions. In this way the Youth Research Collective to which I belong is giving its support to overall labor intensification. The Youth Research Collective developed this process-flexible robot and made it available to the national economy 3 months ahead of schedule.

Our robotics technical school is a vivid example of this. In implementing the resolutions of the 1981 10th party congress there are working here contractually and hence on an economically regulated basis specialists of the ZIM in cooperation with specialists from the institutes for mechanics and for cybernetics of the Academy of Sciences of the GDR. Each of us gives of his best and brings new ideas into the often "hot" debates as to ways of increasing robot quality and robot productivity. Activity in the laboratory has become more creative. For example, the "academicians" brought along some of the newest measuring techniques and thus we have automated the costly measurements required in testing and we use computing technology for the evaluation of these measurements. Result: Besides greater accuracy in the results there has been a shortening of laboratory time by about 80 percent.

Thus we gain time for creative work. For it is part of the assignment of the collective in the robotics school to see to it that the robots of tomorrow learn their "grasping" more rapidly so that they shall contribute to maximum performance gains in the factories--whether in flexible manufacturing sections or in the modernization of existing equipment. For this reason the collectives of the combine provide counsel in the current discussion of 1986 plan tasks. This counsel aims at showing how with new products and technologies efficiency can be further increased. While the overall rate of innovation is

31 percent it is expected to be over 50 percent in industrial robot technology.

Our share in this: At the present time we are setting up the welding workplace which is a part of the technological unit employing the ZIM 10-1 in arc welding. Production is starting in the year of the party congress. These efficient instruments of rationalization will be handed over "turnkey-ready" to the factories--we are working particularly for the labor intensification projects in metallurgy. In addition, the series of ZIM robot models is being augmented with a gantry robot. It can handle a useful load up to 350 kg and can thus bring greater efficiency to many transport, transloading and storage tasks. Now the collectives are vying to make it possible for the first exemplar to be put into operation in time for the "Day of the Metallurgist" in November of this year.

8008

CSO: 2302/85

HUNGARY

COMPUTER, ELECTRONICS EXPORTS FOUNDERING

Budapest FIGYELO in Hungarian 18 Jul 85 p 19

[Article by Margit Racz: "CEMA Experiences; Electronics Export Amidst More Difficult Conditions"]

[Text] Electronics (and primarily computer technology therein) began a buildup in the CEMA countries in the 1970's, and the growth of it quickly accelerated.

This was the product group in the export of the Hungarian processing industry directed to the CEMA countries which was profitable on the basis of transferable ruble receipt prices independent of the current magnitude of the internal regulators. But in the period under study and in the enterprise sphere the profitability of export constantly decreased, which was interdependent with the constant decrease in the novelty value of electronic products. (The study was performed by the World Economy Research Institute of the Hungarian Academy of Sciences. A substantive preview of a FIGYELO series prepared on the basis of the survey embracing 31 enterprises is given in issue No 15, 1985.)

Slow Product Exchange

In regard to the ruble sales price moved by the novelty value we should certainly take into consideration two factors outside of CEMA. One is the terribly swift, expansive development of electronics in the capitalist countries, accompanied by a swift product exchange. Not one of the CEMA exporters was capable of achieving a product exchange, that is rate of technical development, at even approximately the same pace. As a result of this--on the basis of the Bucharest price principle--the sales prices of the exporters necessarily fell. Thus it could happen that the Hungarian computer technology enterprises were forced to lower the prices of their export going to the socialist countries every 3-4 years, which is not too characteristic of the movement of processing industry export prices in CEMA. All of this resulted in a steeper life curve, or shorter life expectancy, for the economical export of the products--compared to the other product groups of processing industry export. To this extent the price development for electronic articles followed the world trend. But the world trend was not followed in that the exchange of products in the CEMA export of the enterprises and in their import from there should have been substantially faster than for processing industry products being traded among them in general.

the autarkic position felt that the best defense against the latter could be found in a developmental path in which the CEMA priorities could be separated from the world market, in regard to speed, and could be an independent, closed world. The sagging of the CEMA export prices made this view untenable in a very short time.

There were, and still are, a number of products in the Hungarian electronics industry the level of which exceeds the quality of similar products of the other CEMA exporters. (In addition, this quality superiority manifested itself from time to time in the fact that one or another of the CEMA partners refunded the dollar content of the Hungarian export.) In recent years, however, the import possibilities of the Hungarian enterprises from capitalist countries have deteriorated--in part because the temporary import restrictions have been extended to parts and in part because of the embargo policy of the shipping countries. This has influenced this product sphere unfavorably, because it can be accompanied by a lowering of relative advantages.

Parts Dilemmas

There are enterprises in the electronics industry a large part of the products of which are sold domestically--sometimes more than 70 percent. In every case this circumstance has had a stabilizing effect on the financial situation of the enterprise, especially if the enterprise manufactured parts to a significant extent and sold them domestically. Still, this method for a lasting stabilization of the financial situation has not spread generally.

Parts supply is one of the central questions of electronics. The capitalist import need of current production cannot be reduced to a significant degree because there is a need for parts which, for the time being, cannot be replaced now. A number of attempts have been made in the past decade to increase the import of parts from CEMA countries. A considerable number of the enterprises questioned had attached great hopes to the idea of being able to import more parts from socialist countries, after appropriate market research. They quickly discovered that this could be realized only in part.

The enterprises started from the supposition that a broad assortment of standardized parts were being manufactured in the CEMA countries. However, the volume produced falls below the needs at the CEMA level, often even at the national level--which is customary for parts in general in CEMA. It follows from this that the manufacturers in each country have little interest in socialist export. It was the general experience at the enterprises questioned that the socialist partners want to export finished products instead of parts.

Thus the restricted convertible import possibilities necessarily led to encouraging the domestic manufacture of parts taking the place of capitalist import. With the domestic parts prices this contributed significantly to the lasting stability of the financial situation of enterprises manufacturing large volumes of parts for domestic use.

The development of Hungarian computer technology export to CEMA countries is worthy of special mention. Computer technology has become a stressed product group in CEMA contacts and domestically (the CEMA specialization and the central

The other factor outside of CEMA was the reliance on convertible accounting import. This means that the convertible import content in export products going to CEMA countries is significant to this very day--similar to other processing industry items. This ratio has been decreasing for a few years, but it is still characteristic of the export products of enterprises manufacturing electronics and of the export products of enterprises building electronics into their products to a significant degree.

In the case of finished product manufacturers the convertible import was often coupled with license purchases. It is the experience that where these license purchases were successfully renewed parallel with technical progress, that is where the Hungarian customer regularly got access to the newest technical achievements within the framework of the contract, there the product was not devalued in CEMA export, in either the absolute or relative sense. This also means that it was primarily finished products which avoided the devaluation, as opposed to parts or system export. We must also call attention to the fact that it was not simply the capitalist import which held back the devaluation process mentioned; the more the convertible import content exceeded the average the better the product resisted the devaluation.

A Market Which Carries the Overhead

In general the CEMA export which counts as lastingly successful in the enterprise sphere studied did not lead to a more significant increase in capitalist export. It was emphasized at a number of enterprises that up to the beginning of the 1980's that was not even their task, no one expected it of them. Their capacity was created primarily with socialist export goals, which naturally had the consequence that the CEMA market determined the developmental directions of the product group and the entire developmental policy. This is especially true of enterprises which do not primarily manufacture electronics but rather only build in electronics, even though their capitalist export is significant. Thus, while the convertible import was built organically into the production of the enterprises, capitalist export was not a primary developmental policy goal.

But when increasing convertible export became a priority economic goal in general, the enterprises had to be made sensitive to this new priority with continual regulation. This happened within a short time in the 1980's, when the regulators made convertible export relatively more profitable. For the electronics enterprises, however, the not too significant profitability advantage was not sufficient for an even minor change in the export structure and relationship ratios which had developed.

Since a structural change corresponding to the new priority did not follow the modification of regulation, the financial situation of the enterprises weakened, but at the electronics enterprises the deterioration was not so great as to make export directed to CEMA countries require support.

In the course of a study made among electronics enterprises it was discovered that there was an enterprise opinion still being voiced in the mid-1970's according to which the development of electronics could be realized in CEMA on the basis of its own goals, for its own needs--making outelves independent of the speed of world market product and price changes. The representatives of

development program). In general this was accompanied by protection from market effects for the participating enterprises. But the unique characteristics of the branch were stronger than the protection. Technical development or product exchange lagged behind the pace of the world market here most of all, and this was reflected in the CEMA market prices too, which sooner or later were forced to follow the significant world market price decrease.

According to the findings of the study, those enterprises were best able to escape from this situation which were capable in recent years of increasing the weight in their export of other electronic products, or products building in electronics, in addition to the computer technology export they were obliged to undertake. If this was a good quality, custom product it would compensate for the price loss of the computer technology export. But this developmental policy is not characteristic of the largest computer technology exporters. It was the general finding among the enterprises surveyed that the products of enterprises manufacturing custom items with electronics built in were best able to resist the price reducing effects, while the computer technology exporters were forced to post a large price drop.

As a whole it can be established that the electronics enterprises surveyed got into the new, partly less favorable situation in CEMA export in the 1980's which is characteristic of the other branches of the processing industry, primarily of the traditional machine industry, and this requires a modification of the earlier enterprise strategy.

8984

CSO: 2502/63

HUNGARY

STATISTICAL OFFICE COMPUTER POLICY CRUCIAL

Budapest FIGYELO in Hungarian 11 Jul 85 p 4

[Article: "Thinking About a Decision. The Management of the Applications of Computer Technology"]

[Text] The field of computer technology applications has developed dramatically in recent years, its income has increased by 20 percent every year and its gross stock inventory by 12 percent. In spite of its attractive, progressive nature and profitability, the task of the management of this field is to further speed up progress which, while dynamic by Hungarian standards, is not rapid by international comparison. One reason is that the investments in computer technology have not increased significantly for years, and the computer inventory has become old.

In recent past the Council of Ministers with its laws 13/1985 (III. 20.) MT and 1017/1985 (III.20.) MT has recognized the growing importance of the development of software, the supply of information and the management of this field, and has invested the president of the Central Statistical Bureau (KSH) with the legal authority of a minister of this sector.

The authority of the KSH concerning the applications of computer technology extends over the following domains: the production of software (programming and documentation, with the exception of basic software), the production of computer-generated information, data processing done by machine (computer-time utilization, intellectual work-for-hire, data collection, provision of information), and research in computer technology and experimental developmental work. Not under its control are those customers having payroll-processing done or information delivered to screens who do not do data processing by machine or conduct data-organizing activities. From the point of view of the computer technician, it is not easily understandable why the production of basic software was made an exception, because a translation program for languages is prepared in the same way and has the same appearance as most application software.

It is important in what spirit the KSH approaches the task of directing the applications of computer technology. The fact that the procedure was developed by the Council of Ministers within the framework of the direction of the field of economics signifies that the government plans to direct this

activity primarily not by direct executive control but with indirect economic-legal means, and that the first principle will be that of profitability. In this respect the KSH must continue its past practice of the management of the field by further loosening restrictions, by simplifying the conditions of work of those who engage in the production, service and marketing, and by developing a legal structure that is unambiguous and consistent. It must also speed up the production and marketing process, improve the profitability of these activities and develop products and services for the market.

One of the key issues of the economic policy of the field is whether it will be targeted to satisfy the internal needs of the country or if it will be directed as a competitive field to support the total economy of Hungary and will attempt to best utilize its component units in the internal arena. An open market, as well as the fundamental interests of the field, the country, and the socialist camp relating to technology imports require the latter direction. It is, however, apparent that an activity that is competitive on the world market can only be conducted by those companies that are provided with the international quality means of production, work force and materials. On the national level one must strive towards the goal of satisfying these requirements of the companies working in this field.

The Hungarian market has a continuing shortage of software products, computing tools, computer experts and information. Standardization of the requirements and overcoordination would merely lead to a further narrowing of the already scant supply. The management of the field should devote itself, besides increasing business, primarily to stimulating the development of products and services. One should not increase the "receiving ability", that is, the demand, and thus exacerbate the already existing shortages; rather, one should increase the number of enterprises, which after a time would lead to the sharpening of competition and thus to the improvement of the cost/benefit ratio. This will ultimately result in an increased demand, but at a higher level. In a market in equilibrium, the jockeys of the wildly expanding economy will not flourish, nor will the producers of goods and services of substandard quality prosper.

Besides general directives, there is a need for specific government actions. One of the obstacles to the further expansion of the applications of computer technology is that there are no networks suitable for long distance data processing. In order to change this situation, it is necessary to mobilize all available means inside and outside the country. In years past, like in other important fields, less than the necessary amount of funding was devoted to truly pioneering research and development ideas. For example, little money was spent on artificial intelligence research, specialized systems, software making possible the use of natural languages for communication with machines, and mindware (a computing tool that models human thinking and contains ordered data as well as problem solving programs). All these must be provided if we want to remain competitive in the future.

The tools of development should be applied to those activities that are not yet profitable for commercial enterprises or which are associated with too much risk. It is also advisable to revitalize the availability of information services and the marketing of the data processing products of computer technology, in the same way as was done for software products.

12846

CSO: 2502/60

HUNGARY

BRIEFS

HUNGARIAN, INDIAN SCIENTIFIC COOPERATION--At the invitation of the Hungarian Academy of Sciences, C.N.R. Rao, head of the Indian Academy of Sciences visited Hungary 15-18 July. A scientific cooperation agreement, to extend from 1985-1988 was signed by officials of the two academies. It calls for exchange of researchers in the field of natural sciences, the setting up of seminars and an institute cooperation in the areas of reactor physics, solid state physics, organic chemistry, biotechnology and neurology. [Text]
[Budapest NEPSZABADSAG in Hungarian 19 Jul 85 p 5]

CSO: 2502/64

CONTENTS OF LATEST AUTOMATION, CYBERNETICS JOURNAL SUMMARIZED

Warsaw ARCHIWUM AUTOMATYKI I TELEMCHANIKI in English No 4, 1984 pp 407, 427, 442, 443, 458, 470, 491, 499, 508, 521

[Quarterly journal of the Polish Academy of Sciences Committee for Automation; press run completed May 1985]

[Text]

RYSZARD GESSING, O. L. R. JACOBS

About Equivalence Between Closed-Loop and Open-Loop Feedback Controls

Received 12.III.1984

Conditions of equivalence of the closed-loop CL and open-loop feedback OLF control strategies are formulated and proved. For the linear-quadratic LQ problem the conditions concern some covariance matrices of the estimation errors. It is shown that for some general class LQ Gaussian problems both the strategies are equivalent. The equivalence also exists in the case of LQ problem with complete state information and any disturbances in the form of stochastic processes of the second order.

J. BRZOWSKA-WASOWSKA

SYNTHESIS OF A MULTIVARIABLE SYSTEM WITH A GIVEN TRANSFER FUNCTION IN THE CASE OF THE ACCESSIBLE OUTPUT VECTOR

Summary

The paper concerns the synthesis of a multivariable linear continuous time-invariant system with a given transfer function defined for the j -th output and i -th input ($i = 1, 2, \dots, m; j = 1, 2, \dots, q$).

A method proposed is a generalization of the synthesis algorithm designed for continuous time-invariant system with the accessible state vector, given in [1], to the case of the accessible output vector.

R. PYTLAK

OPTIMALITY PRINCIPLE FOR DISCRETE MINIMAX OPTIMAL CONTROL PROBLEMS

Summary

For a control system described by difference equations an optimal control is determined as a result of minimization of the scalar performance index $\max_{k \in 0, N-1} q[x(k), u(k), k]$. In such a case the optimality principle does not always hold. Necessary and sufficient conditions under which this principle is met are determined. Results presented in the paper are more general than those obtained previously.

KRZYSZTOF PAWLIKOWSKI

Evaluation of Slot — Assignment Techniques in Loop Communication Networks

Received 27.VIII.1982

A computer communication network consisting of a number of terminals connected to a computer by one or two (parallel) unidirectional transmission loops is considered. In such a network the fixed slot assignment and the demand slot assignment are evaluated, assuming an inquiry-response type traffic pattern and the mean response time as the measure of performance.

Numerical results are presented for Poisson input processes of messages and geometrical distributions of message lengths (in packets).

W. SOBCZAK

THE NOTION OF SELECTION OF INFORMATION ON RANDOM SIGNALS

Summary

The paper is concerned with a possibility of applying the loss functional, used in the theory of signal detection in the presence of noise, for purposes of selecting information on random signals.

For signals, which can be expanded into series of orthogonal functions, simple criteria of estimation of so called partial information can be formulated. Under simplifying assumption introduced, the measure of partial information utility is given by its variance.

K. WALCZAK

DEDUCTIVE SIMULATION IN MODULE SYSTEMS

Summary

The paper presents two techniques of the failure list propagation through a logic module, which are used for purposes of the deductive failure simulation intended for module systems.

These techniques make use of two types of the module functional description: Binary Decision Diagram and Inverse Sequential Description.

J. SIKORSKI

ON THE SURROGATE CONSTRAINT DUAL PROBLEM

Summary

Some theoretical properties of the surrogate dual problem are described in reference to minimization problems with a cone representation of constraints. Connections with the Lagrangian dual problem and quasiconvex programming are discussed. Two advantageous characterizations of the dual optimal value are presented.

E. SKUBALSKA

VEHICLE ROUTING PROBLEMS. MATHEMATICAL MODELS

Summary

In the paper a general vehicle routing problem and its mathematical models are formulated. Constraints describing vehicle routes and the flow of a transported material as well as time constraints are introduced.

New performance indices are proposed, in which two components of the total cost of routes are taken into account: the total travel cost and penalties due to the earliness or tardiness of the service of individual delivery points and those resulting from the fact that some requirements of the delivery points are not satisfied.

B. PLESZCZYŃSKA, A. PLESZCZYŃSKI

NETWORK OF MODELLING AUTOMATA

Summary

The paper presents a method of constructing mathematical models of complex technological processes, based on the automata theory. The notions of a modelling automaton and automata network are introduced. Using them, a model of the process is constructed. An algorithm for computer simulation of the processes considered is also given.

J. GALAJ

SOME PROPERTIES OF DISCRETE SPECTRAL IDENTIFICATION OF MULTIVARIABLE LINEAR CONTROL PLANTS

Summary

In the paper a method of discrete spectral identification of linear multivariable control plants is presented. It relies on the expansion of input and output signals into discrete orthogonal series making use of the Walsh function. A numerical identification algorithm is worked out. Its successive computational steps are described in detail.

For a single-rotor helicopter, considered as a control plant, a digital simulation of the identification system was carried out. Results of the digital simulation provide the answer to some problems of discrete spectral identification, e.g. to the question of the influence of the duration of discretization period on the overall identification error.

POLAND

HIGH-TECH JOURNALS SUMMARIZE CONTENTS

Advances in Mechanical Engineering

Warsaw MECHANIK in Polish No 1, 1985 p 5

[Text] Z. CZECHOWSKI: Tool systems for NC machine tools and machining centres. Mechanik No 1/85, p. 7. Discussion and a comparative analysis of tool systems used in NC machine tools and machining centres. A structure of the tool system. Systems of turning and rotary tools. Proposal of unifying the terminology.

Z. KUBALA, W. PSZCZOŁOWSKI, P. ROSIENKIEWICZ: Belt grinders. Mechanik No 1/85, p. 21. Advantages of belt grinding trends of this process in the world. Description of main types of the abrasive belt guiding and pressing systems within the grinding zone. Characteristic of several groups of belt grinders.

J. SZWABOWSKI, M. ZASADA: Life testing of the point of multi-point turning bits. Mechanik No 1/85, p. 29. Scope, methodics and results of life testing of the point of multi-point turning bits having an angle $\alpha = 55^\circ$ for build-up turning tools. Influence of the bit shape, corner radius r , bit material and the work-piece material upon the point life. Selection of the value of the constant and indices for the Taylor formula $T = f(v, p, g)$.

M. KRAWCZYK: Checking the curvilinear surfaces of aircraft engine blades by the immersion method of holographic interferometry. Mechanik No 1/85, p. 35. Description of a measuring stand for checking the curvilinear surfaces of aircraft engine blades. Factors influencing the measurement accuracy.

H. MIERZEJEWSKI: A system for automatic perforation of textile spinning nozzles PERFIL. Mechanik No 1/85, p. 39. Description of the elements of a system designed for making holes in textile spinning nozzles: machine tools, numerical control system and programming. Results of testing the system.

Z. LUSZCZYŃSKI: Making the teeth of bevel gears by the one-sided rotary method. Mechanik No 1/85, p. 45. Analytical determination of the rotation angle of a work-piece spindle in gear cutting by the one-sided rotary method. Advantages of the proposed solution.

E. PAJAK: Analysis of the formation of circularity deviations of centrelessly ground work-pieces. *Mechanik* No 1/85, p. 49. A model of circularity deviations' formation in centrelessly ground work-pieces, based on an analysis of the equation of the work-piece motion. An example of the trajectory of the work-piece centre while grinding; influence of the centre position upon the changes of grinding depth.

A. SALA: The function of technological energy consumption. *Mechanik* No 1/85, p. 55. A relation between the technological energy consumption and the coefficient of production machinery utilization as a basic function of the technological energy consumption. A mathematical description of this function and influence of various factors upon its course.

A. BULAT: A device for breaking spent oil emulsions by the electrostatic-electrolytic method. *Mechanik* No 1/85, p. 61. Description of the above-mentioned method for breaking spent oil emulsions. Technical characteristic of a device RESEL-1000 operating according to this method.

E. BRZUCHOWSKI: Energy and power at people's service. *Mechanik* No 1/85, p. 63.

This journal is devoted to the technical and scientific problems in the field of metrology, measuring methods, industrial automatic control, fine mechanics and quality inspection. It contains both reviews and detailed articles dealing with the theory of measurement, measuring methods and systems, design of measuring and scientific instrumentation, theory and design of control systems, especially for industrial process control, theory and design of precision mechanism. This periodical also contains the following regular features: Measuring and Automation Practice, New Products of Home Instrumentation Industry, Standards, Techniques, Applied, News, Bibliography, Bulletin "Chemoautomatyka". This periodical is intended for engineers employed in industry, for research workers, students, designers and users in the a.m. fields.

Orders for the subscription of the POMIARY, AUTOMATYKA, KONTROLA should be placed at the Polish agency "Ars Polona-Ruch", ul, Krak, Przedmie cie 7, 00-068 Warszawa, Poland.

Advances in Measurement Technology

Warsaw POMIARY AUTOMATYKA KONTROLA in Polish No 3, Mar 85 p 92

[Text] UDC 631,322.534
IFAC 4.0.5,2

KASINSKI A., KOZLOWSKI K., WROBLEWSKI W.: Examples of coupling the ZX 81 microcomputer to measuring instruments used in experimental physics. *Pomiary, Automatyka, Kontrola*, 1985, No 3, p. 65, figs 3

The authors present two sets consisting of specialized measuring instruments and a microcomputer ZX 81 used in experimental investigations in the field of quantum optics. The coupling is effected by means of a general-purpose parallel interface. A plain microcomputer connected to measuring stands provides a possibility of interactive processing of experiment results.

UDC621.317.7-501.14
53.072.13
IFAC 4.2.3.0

ZUCHOWSKI A.: On a possibility of using simplified models for analysing the dynamics of non-linear measuring instruments. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 67, figs 4

An attempt is presented of utilizing the so called simplified models for determining the response of non-linear measuring instruments to time-varying input signals.

UDC620.179.1
621.375.826.004.14
IFAC 3.2.6

MANDECKI K.: Non-destructive measurements of strains, stresses and cracks in deformed elements of rigid structures and machines by laser speckle photography. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 70, figs 4

The author presents a new non-destructive method, as regards the industrial laboratory practice in Poland, using coherent light for analysing strains, stresses and cracks of the elements of rigid structures and machines. The laser speckle photography is based on the occurrence of speckles' effect in the cross-section of a laser beam reflected from a rough surface. The interference speckle images of the different states of strain on a surface under examination permit a very accurate analysis of structure of that surface.

UDC620.179.1
621.375.826.004.14
IFAC 3.2.6

KONTRYMOWICZ B.: An object silhouette recognition method using simple two-state sensors for the orientation of the industrial robot gripper. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 73 figs 2

The method presented allows selection of the regions of an image which ensure recognition of an object and its position from among a finite number of masters. Application of simple two-state sensors permits to operate the image silhouettes. Objects to be gripped and manipulated by an industrial robot should be fed singly and pre-orientated by two stops on a belt conveyor or a trough. Such a solution is a compromise between an expensive mechanical tooling for precisely locating the objects in one definite position and sophisticated vision system based on tv camera images allowing a "free grip" from a bin.

UDC 535.853-2
IFAC 3.2.4.9

SQEDOWSKI A.: An interferometer for measuring the flatness of optical surfaces. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 76, figs 4

The author describes a vertical interferometer used for laboratory and workshop measurements of surfaces of up to 180 mm dia. The interferogram obtained for laser or mercury-vapour light in the form of shadowy or contour lines is observed and measured on a tv monitor. The interferometer also allows auto-collimation or interference measurements of non-parallelism of plates, non-sphericity of concave and convex surfaces, and also non-uniformity of refracting index.

UDC 621.3.018.8:621.317.7
IFAC 4.2.3.1

TARNOWSKI Z.: Calculation, design and production process of oil dampers used in analog measuring instruments. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 78, figs 9

This article is an abridgement of the lecture delivered at a conference organized on the 30th anniversary of the "Lurnel" Works of Zielona Gora. Presented are the problems of design, calculation and filling the liquid dampers. An oil-filled damper in the form of a pivot bearing is discussed in detail.

UDC669-41.001.5
IFAC 3.2.4.9

DABROWSKA, J., KAJURA A.: A test stand for determining characteristics properties of bimetals. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 83, figs 2

This article presents the design and applications of a test-stand for examining properties of bimetals. The stand consists of two parts: one for determining changes in deflexion and resistance, and the other--for determining Young's modulus of bimetals. The test-pieces are heated indirectly by means of oil. The test-stand allows examination of straight bimetals with rectangular cross-section.

UDC621.9.077.66
IFAC 5.6.3.0

SOLDATY A., LAPUCHA A.: Application of robots in chemical industry. Part I. *Pomiary, Automatyka, Kontrola*, 1985, No. 3, p. 9, figs 4

The authors present work stations in chemical industry which can be automatized through introduction of robots. This part I of the article contains basic information on robotics and technical characteristics of Polish industrial robots. In the part II, basing on an analysis of work stands and foreign solutions, the authors indicate modifications to be carried out on robots that they should meet requirements imposed by chemical industry.

ROMANIA

SHORTCOMINGS IN IMPLEMENTATION OF SOLAR ENERGY PLANS

Bucharest FLACARA in Romanian 31 May 85 p 18

[Article by Mihail Florescu, minister state secretary in the National Council for Science and Technology]

[Text] [Question] What is the position of solar energy in CNST's (National Council for Science and Technology) activities in the energy field?

[Answer] After the first oil crisis in 1973-1974, at the initiative of the secretary general of the party, Nicolae Ceausescu, the first solar energy program was formulated in 1974 to produce thermal and electrical power as one alternative to the current and future shortage of hydrocarbons.

On this basis, CNST also assigned priority to activities aimed at exploiting solar energy resources.

The reports presented by the secretary general of the party, Nicolae Ceausescu, to the 11th, 12th, and 13th Congresses, stress the need for a more rapid construction of installations for exploiting inexhaustible energy sources, primarily by beginning to use solar energy.

The Report to the 13th Congress of the RCP, in the chapter entitled "Directions for Socioeconomic Development During the 1986-1990 Five-Year Plan," indicates: "Particular attention will be devoted to new sources of energy, such as biomass, wind power, solar energy, and others."

On this basis, CNST has given special attention to technical research, prototypes, equipment, and implementation in agriculture, industry, and sociocultural areas.

[Question] What are the concrete results of CNST's concern to create and implement solar technologies?

[Answer] One decade after this important decision was taken by our party leadership, a large number of exploitation technologies were established on the basis of programs formulated under the direct leadership of the chairwoman of CNST, academy member, doctor engineer Elena Ceausescu.

Large projects of scientific research, technical experimentation, and mass production were undertaken, leading to 35 projects in the solar energy field, as follows: solar installations to prepare hot water for livestock farms; solar installations to produce hot air for drying grain, vegetables, fruits, hay, and seeds; solar installations to prepare technical hot water at industrial enterprises (12 projects); solar installations to prepare household hot water in housing units (12 projects); solar installations to heat housing units; solar installations to prepare hot water for users of sociocultural buildings, such as boarding schools, kindergartens, day care centers, medical clinics, seashore buildings, hotels, tourist rest areas, and so on.

The research and experimentation program continues to improve solar collectors, formulate projects to use solar resources to heat housing units during the winter, and provide household hot water throughout the year.

The Executive Bureau of CNST has discussed the draft of the Program for Scientific Research, Technical Development, and Introduction of Technologic Progress in the Solar Energy Field for 1986-1990. This program seeks to expand the use of solar energy, increase the efficiency of collectors, apply new solutions and systems for providing hot water, hot air, and heating, and for producing electric power, reduce investment costs and material consumption, and so on.

[Question] What is the present stage of the "sun program" in terms of the starting level, and in terms of the objectives established for this area?

[Answer] In 1984, the gain was 12,171 tons of conventional fuel, primarily from the Ministry of Agriculture and the Food Industry and from county people's councils, which produced nearly one-half of the total value.

The achievements would have been greater if the investment objectives established by the plan for 1983 and 1984 had been completed. Economic ministries did not assure the timely start of construction, nor the conditions for starting these objectives on schedule.

An analysis conducted together with the Bank for Agriculture and the Food Industry has shown that of the 665 modules for producing hot water at livestock farms, an especially valuable initiative from the Ministry of Agriculture, only 105 were installed during 1984, and that the conditions for executing the work had not been created in 11 counties on 31 March 1985.

Following the good results obtained at Oltenita with the solar energy large-capacity grain-drying installation, the Department for Constructions, Acquisitions, and Preservation of Agricultural Products has taken measures to extend its use and build 30 installations throughout the country. Eight of these were completed by the end of 1984, ten are expected to be finished in time for the 1985 harvest season, and 12 are being built in 1985 with a start-up schedule of August-October 1985. It is important for all these facilities to be placed in operation on schedule.

The construction of solar installations in 1984 was difficult: only 32 of the 63 objectives to be built by county people's councils were placed in operation.

Alba, Bacau, Caras-Severin, Cluj, Constanta, Giurgiu, Ialomita, and Olt counties, as well as the City of Bucharest fully completed their tasks; Calalrasi, Dimbovita, Galati, Prahova, Mehedinti, Tulcea, and Vaslui counties did not fulfill theirs; and Dolj and Teleorman counties completed only a small percentage of their work.

Some counties unfortunately had no solar energy tasks during 1984; they are Arad, Hunedoara, Iasi, Mures, Neamt, Sibiu, and Vrancea.

All the 1984 objectives had all their necessary technical and economic documents, including execution details, but the cause of last year's shortcomings is solely the lack of concern on the part of users.

Based on the installations to be placed in operation according to the plan, a production of 35,790 tons of conventional fuel has been established for 1985, representing a 2.6-fold growth.

[Question] What difficulties (and of what kind--from material, objective ones, to those which involve levels of scientific education, and subjectivity in general) stand in the way of an optimum pursuit of the solar energy program?

[Answer] To fulfill the 1985 plan, it is necessary for ministries, county people's committees, and other plan assignees, to assure the approval of documents and to immediately start the work established by the plan.

MICM (Ministry of the Machine Construction Industry) and MCInd (Ministry of Industrial Construction) must assure equipment deliveries consistent with the execution program and schedules for placement in operation. Construction enterprises of the MCInd and of people's councils must execute their work in time for scheduled dates of operation.

For installations that have already been built, measures must be taken to operate at full capacity. Only under these conditions will it be possible to fulfill and even surpass the plan established for 1985.

Following the valuable exchange of experience that took place in Olt County, the recent show of the major achievements obtained from the more intensive use of new and reusable sources of energy, and the indication of the secretary general of the party, Nicolae Ceausescu, a new breath of confidence is felt in counties and ministries to fulfill the plan and substantially exceed production capabilities in new and reusable sources of energy, materialized in organizational and execution measures such as those taken by the Olt County Party Committee.

11,023
CSO: 2702/11

END